AVIATION
FOR AUGUST 1933

**In 1933, even more than in past years, the story of the National Air Races is an engine builders story. Never before has there been such a dearth of aerodynamic improvement as during the period between the last two races. With the brilliant example of transport plane development in recent months to serve as a stimulus, some of the principles involved ought to find application in next year's racing planes.**

# Power for performance at the National Air Races

*By Franklin R. Collbohm and W. B. Oswald*

THE 1933 National Air Races held at Los Angeles proved very disappointing to those who attended in anticipation of seeing the latest developments in aeronautical design. The ships participating in the races showed no advancement and no new features over those in last year's Air Races at Cleveland. There were only two new ships on the field, the majority of the planes being those used last year without modification or with merely an increase in horsepower. The new ships were both powered with four-cylinder Menascos, the one built by Art Chester being flown by himself, while the Larry Brown entry was piloted by Lee Miles.

### *Speed by brute force*

During the past year, most of the racing plane designers have concentrated their efforts on getting additional power and have left credit for improvement in performance to the engine manufacturers. The only noticeable trend in the design of racing planes is the increase of speed by brute force.

There are several outstanding examples of this trend that are probably familiar to all who read the daily papers. One is the famous Wasp powered Gee-Bee which last year won the landplane speed record of over 294 m.p.h. in the hands of Jimmie Doolittle, and which was this year reworked to take a supercharged Hornet. Another Gee-Bee, last year powered with a Wasp, Jr., engine was stepped up in speed for these races by changing over to a Wasp Sr. However, due to the unfortunate mishaps which occurred during their participation in the Bendix transcontinental race neither of these ships arrived in Los Angeles to take part in the closed-course speed events there. Roscoe Turner's Wedell-Williams Special, the fastest plane in the races this year, had been changed from Wasp, Jr., to Wasp, Sr., power since last year's races, giving it considerably better performance. As neither of the high powered Gee-Bees got through to Los Angeles, there was practically no competition for the Wedell-Williams machine. The general interest was therefore concentrated, to a large extent,upon the smaller ships powered with engines in the 375 and 550 cubic inch displacement classes.

The small planes were, of course, much more evenly matched and furnished the spectators with very interesting and exciting individual contests. These groups showed a great predominance of Menasco air-cooled in-line engines, of both the four and six-cylinder types. In fact, only one plane in this class was not Menasco-powered—Wittman "Chief Oshkosh," with a 110-hp. Cirrus.

### *In and out of cow pastures*

Wittman performed the remarkable feat of flying this little machine all the way from Wisconsin to Los Angeles. To realize the significance of this achievement one must understand that the Chief Oshkosh had very much the shortest wing span of any plane present at the races, or only 14 ft. 4 in. The wing area is just 43 sq.ft. The flying of one of these tricky little racing planes "in and out of cow pastures all the way across the country," as the race announcer described it, indicates that they may be good for something other than rounding pylons at top speed, given a good enough pilot. For ships in the smaller displacement classes, the

air-cooled in-line engines such as the Menasco and Cirrus seem to be very desirable, since they are so easy to cowl and since the disposal of the exhaust is so simple, particularly in the case of the inverted type, with practically no danger of exhaust fumes getting into the cockpit. This problem of exhaust disposal has not yet been entirely satisfactorily solved in connection with the larger radials, although the idea of getting cockpit ventilation from a point forward of the exhaust works out very well with the completely enclosed cockpits now being used.

### *More speed, more cooling*

One of the new Menasco-powered ships had an interesting cooling air outlet which was reported to result in the best cylinder cooling of any installation of this type. This was an N.A.C.A. type exit at the rear of the engine cowling, which was obtained by allowing a space between the contour of the engine and the fuselage when viewed from the rear. No louvres were used, since the air was exhausted from inside the cowl in the same manner as it would be from inside an N.A.C.A. ring cowl. The efficiency of this arrangement has previously been proven by wind tunnel tests and also by actual flight performance when applied to oil radiators on some Army observation airplanes. It is interesting to recall that the speed of the Northrop "Beta," which was also fitted with a Menasco engine, was increased 6 m.p.h. by closing the louvre in the cowling and exhausting the cooling air through an N.A.C.A. exit. This type of exit must be correctly proportioned to give satisfactory results, but offers good possibilities of gaining a few miles per hour speed with no decrease in engine cooling.

The control surfaces on most of the planes at the races were entirely unbalanced. Undoubtedly a perfectly safe policy for small ships, but for larger and faster planes it will probably be found necessary to incorporate not only aerodynamic balance but also static and dynamic balance. The static and dynamic balancing of all control surfaces has been found quite necessary in most of the new high-performance military airplanes to avoid flutter. Small fixed flaps were added to the trailing edges of the ailerons on the Keith Rider and Howard ships to adjust the lateral balance. The adjustment of the flaps, made of sheet dural, was accomplished by bending them on the ground so that they would deflect the ailerons in the direction necessary to correct for wing heaviness.

Minor gadgets showed their value at least once during the races when Art Chester, who was trailing the field, won a race because of the fact that he had installed on his instrument board a lap counter which resulted in his completing the race after all of the other contestants had pulled out one lap too soon. The instrument consisted of nothing but a row of ordinary toggle switches, one to be pressed down at the completion of each lap.

### *Retractable gears scarce*

In general, the streamlining on many of the ships could have been much improved. Wing fillets seemed to be of rather inefficient design in some cases and not in accordance with the latest aerodynamic information. Windshields and cockpit enclosures seemed in almost all cases to be very well faired, but it was most surprising to note the lack of landing gear fairing on several of the ships. Since the drag of a landing gear of the non-retractable type is such a large proportion of the total drag, every effort should have been made to reduce it to a minimum. While the work was very well done on some of the faster ships, there were several examples in which no streamlines were fitted over the wheels and the interference drag between struts and wheels seemed not to have been considered. The scarcity of retractable landing gears (they appeared only on the Keith Rider entries designed in 1931) may possibly have been due to the fact that so few new designs were present. Most of these small fast ships seemed to be rather tricky in landing. This condition, while not serious, could undoubtedly be helped considerably by the use of flaps, not only to reduce landing speed but also to cut down the length of run after landing.

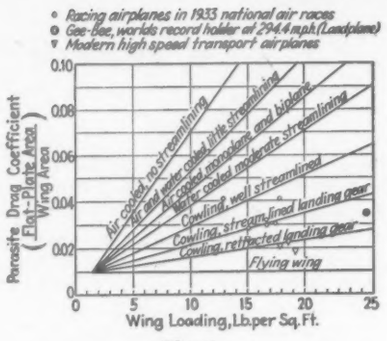



**Fig. 1**

* Reproduced from page 33 of N.A.C.A. Report No. 408.

The general basic design of the 1933 racing ships with their wire-braced wings and fixed landing gears is open to question, for they compare rather unfavorably with the full cantilever retractable-landing-gear type as exemplified in the new type high-speed transports that are now beginning to appear on the nation's air lines. [Nevertheless it is noteworthy that wire-braced monoplanes with thin wings have held all the world's speed records, both for landplanes and seaplanes, for at least six years.—Ed.] The drag coefficient of the present-day wire-braced racing plane is definitely higher than that of the average cantilever transport, as can readily be seen by referring to Fig. 1. Fig. 1 plots the parasite drag ratio, or ratio of the equivalent flat plate parasite drag area of an airplane to its wing area, against the wing loading. The several lines radiating from a point near the origin are marked to indicate the degree of streamlining represented by a point located near them. It will be noted that the points representing the various racing planes fit on this diagram about as might be expected, although the positions are not strictly accurate because of a lack of exact information on the actual thrust horsepower developed. However, the figures are sufficiently accurate to show that there is considerable room for improvement even on the two Keith Rider cantilever jobs and Benny Howard's well-streamlined wire-braced ship, which were the cleanest of the small racers present.

Changing the wing area of an airplane, while leaving all other characteristics exactly the same, will have the general effect of moving its point along the proper line, while a change in weight only will cause a change of position in an horizontal direction. This

*Photo by Stephen J. Zand*

**S. J. Wittman's "Chief Oshkosh," with 14-ft. span, flew from Wisconsin to the Races.**

is due to a better drag-weight ratio, but will of course be accompanied by an increase in landing speed of the airplane. This is illustrated by the position of the Gee-Bee, with its high landing speed. Obviously, the most effective way to better the position of the airplane on this chart would be to move the point downward, which may be accomplished only by reducing the drag.

### *Shrinking the wings*

Some designers seem to have been attempting to reduce the total drag coefficient of their planes by cutting down on the wing area. The effect of a change in area upon the total drag of the airplane is illustrated in Fig. 2, in which the horizontal co-ordinates represent the percentage of change in wing area and the vertical co-ordinates represent the change in total drag. The slanting lines show the difference that a given change in wing area will cause in the total drag of airplanes of varying cleanness, since they denote the total

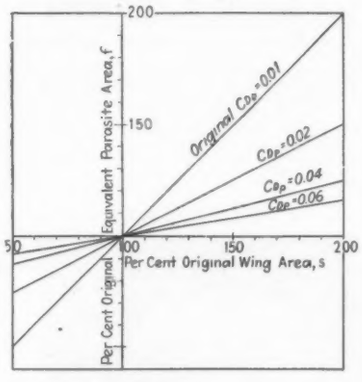



**Fig. 2**

drag coefficients of the airplane in question. The line representing a drag coefficient of .01 may be taken as equivalent to an airplane consisting of only a flying wing, while that representing a drag coefficient of .02 is approximately equivalent to a clean, cantilever-wing, retractable-landing-gear job. The drag coefficient of .04 would represent an average airplane, with cowling and well streamlined but with the landing gear not faired. The airplanes flown in the 1933 National Air Races, on the average, show drag coefficients between .02 and .04 To illustrate the effect of a change in wing area upon total drag, let us assume a 25 per cent reduction in area on a plane with a drag coefficient of .04. The, new area will then be 75 per cent so running down from the 75 per cent point on the horizontal axis to the curve marked .04 and then right to the vertical axis, we find a new value of total drag of 94 per cent, a reduction of only 6 per cent. This represents a relatively small increase in speed in spite of the very much higher landing speed. Of course, if the plane were rather clean, having a drag coefficient of .02, the decrease in total drag would be 12 per cent while the decrease in drag of a flying wing would be 25 per cent. This shows conclusively that cleanness of overall design is of paramount importance, not only because of the higher speed that inherently results but also because of the much increased effect that can be expected from a change in wing area on a clean ship.

The curves of Fig. 2 do not allow for the increase induced drag which would normally be expected with the decrease in wing area. However, since the induced drag is such a small proportion of the total airplane drag at maximum speed to begin with, and since it would change relatively little, the effect may be neglected. Also, the change in weight due to the change in area is not considered, but since this change will at best be only a small percentage of the total gross weight, and since weight alone has but a very small effect upon high speed, the error introduced in this manner is of such small order that it may be disregarded for the purpose of this discussion.

Fig. 3 shows directly the effect of clipping wing area on maximum speed.

### *Follow the transports*

The foregoing would indicate that racing-plane designers might do well to follow the lead taken by the new transports in striving for extreme cleanness with cantilever wing and empennage design and retractable landing gears. With such a clean basic design, very desirable increases in speed could be obtained by cutting down the wing area and thereby raising the wing loading. Of course, the higher wing loading would naturally involve a prohibitively high landing speed unless some type of high lift device were incorporated. There appears to be no valid reason why flaps or other such devices should not be used in these planes, since their effect is to increase speed range. It is obvious that starting with a fixed landing speed the airplane with the highest speed range would, naturally, have the highest top speed.

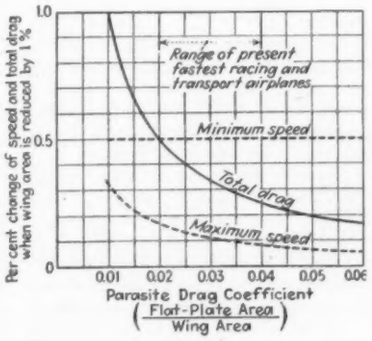



**Fig. 3**

*Photo by Stephen J. Zand*

**An improvised lap counter saved a race for Art Chester when every other contestant landed one lap too soon.**

Flaps are being used for this purpose in several of the new transports with very favorable results. For example, Frank Hawks' new "Sky Chief," a Northrop "Gamma," has a speed range of from 45 to 247 m.p.h. with normal load, and when carrying sufficient fuel for a non-stop transcontinental trip the minimum speed is still only 65 m.p.h. The new Douglas twin-engined transport built for T.W.A. is another example, having a speed range of from 64 m.p.h. to over 200 m.p.h. Also, the Wasp-powered Gee-Bee entered in the Bendix race was reported to have had its landing speed greatly decreased by the use of flaps. The effect of wing flaps may be well illustrated by considering them applied to the Gee-Bee racer holding the present world's landplane speed record of 294.4 m.p.h. Assuming a 50 per cent increase in lift coefficient, we obtain the following results:

| | Without Flaps | Constant Wing Area | Constant Landing Speed |
|---|---|---|---|
| Wing area..... | 95 | 95 | 63.3 |
| Landing speed.... | 90 | 73.5 | 90.0 |
| Maximum speed.. | 294.4 | 294.4 | 304.4 |
| Speed range..... | 3.28 | 4.01 | 3.38 |

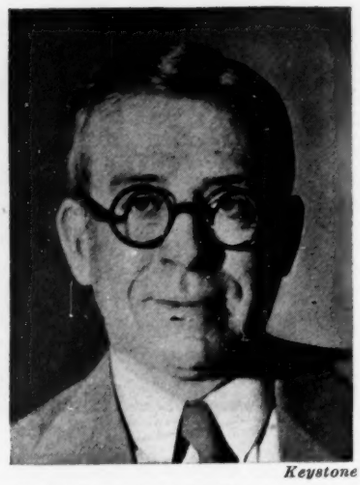
While the added 10 m.p.h. in high speed is appreciable and probably paramount under some conditions, the possible decrease of 16½ m.p.h. in landing speed is certainly desirable in view of the present exceedingly high landing speed of 90 m.p.h.

Summing up, it would seem that the next step in design of racing planes should be a cantilever monoplane with retractable landing gear, having relatively small wing area and using flaps or other high-lift devices to hold the landing speed down to a reasonable figure. It is reported that one of the foremost exponents of the wire-braced type of racing plane, Jimmy Wedell, is completing a new super-speed ship powered with a Wasp, Jr., engine and following those specifications almost to the letter.

# New faces

## Administrators of the

AS THE aviation industry passes through its first major change in National politics, many questions arise regarding the policies of the new administration. The new appointees are being anxiously watched. Practically all of the newcomers in high political positions in the Department of Commerce have been good enough to respond to our request and prepare statements of their views of their new work, for use in AVIATION. Together with brief biographical sketches and photographs of the new executives, they are presented herewith.



*Keystone*

**EWING Y. MITCHELL.** The Aeronautics Branch together with all other Department of Commerce Transportation agencies are now under the supervision of Ewing Y. Mitchell, Assistant Secretary of Commerce. Born in Springfield, Mo., June 5, 1878. Mr. Mitchell attneded the University of Missouri and later studied law in Washington, D. C. He returned to his native city to form the law firm of Tatlow & Mitchell with which he was affiliated for seventeen years. He has long held a deep personal interest in flying. Although active in politics for 30 years, Mr. Mitchell is now serving in his first public office.

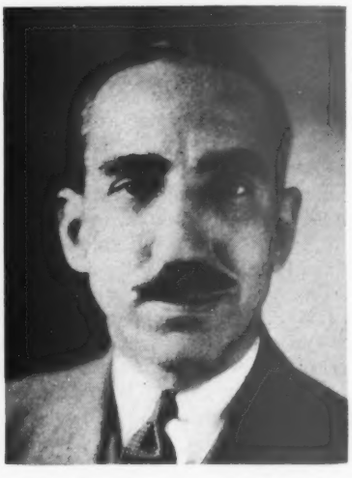
**JAMES C. EDGERTON.** Pilot on the first regularly scheduled interstate air mail flight in history, James C. Edgerton resigned from the Army in December, 1918, to direct further development of the air mail service. Later as radio superintendent for the Post Office Department he developed a system of aeronautic radio and became chairman of the Interdepartmental Communications Congress. In March, 1933, he became a member of the Department of Commerce Reorganization Committee and in June he was appointed Executive Assistant to the Assistant Secretary of Commerce. He was born in Lincoln, Neb., Feb. 2, 1896.

### Ewing Y. Mitchell

*Assistant Secretary of Commerce*

PROMOTION and regulation of air commerce in the United States are among the most important activities of the Department of Commerce at the present time. Already an important

**EUGENE L. VIDAL.** One of the founders of the Ludington Lines, pioneer non-mail-contract operation, Eugene L. Vidal has been actively identified with air transport since 1928, when he was made assistant general manager of Transcontinental Air Transport. The new head of the Air Regulations Department was born in Madison, S. D., April 15, 1895, and educated at the University of South Dakota and at West Point. In 1920 he was transferred to the Air Service and later became an instructor of aeronautics at West Point and football coach for the University of Oregon.



**REX MARTIN.** Author and aviation executive, Rex Martin was born Jan. 30, 1898, in Peoria, Ill., and educated at Southern Illinois Normal University and Northwestern. In October, 1917, he enlisted in the Army Air Corps and served throughout the War. After several post war business connections he became president of the Aviation Sales & Service Company, in Chicago, and in 1931 went to Washington as secretary to Congressman Kent E. Keller, which post he held until his appointment as assistant director of airways. He is the author of a three-volume standard work on civil aviation.

**J. CARROLL CONE.** Major Cone, Director for Aeronautic Development, enjoys a background of sixteen years of continuous flying and has made extensive use of the airplane in his long career in business and public service Born in Snyder, Ark., July 4, 1892, Major Cone was graduated from Quachita College and served overseas in the air forces. After the War he returned to Arkansas and was appointed Assistant Secretary of State. Later he was engaged in aircraft manufacturing at Little Rock and, after serving two terms as State Auditor, he was selected as Director of Aeronautics for Arkansas two years ago.

# and new policies in Washington

## "new deal" for aeronautics in the Department of Commerce, and what they have to say

national industry, aeronautics is destined to develop further, on a scale even more comprehensive than in the past. The rapid mode of transportation afforded by the airplane will continue to make drastics changes in our ideas of the time required for travelling, mailing and shipping, and the use of air transport is bound to increase rapidly.

Only a few years ago (1926), the Department undertook these functions with respect to civil aeronautics in order to foster the establishment of a new industry. Now that the industry has grown up and started upon a career which unquestionably will be a long and useful one, there is a greater necessity for helpful regulation, maintenance of airway aids and the type of general promotional work which can be undertaken only by the Federal Government. The industry having demonstrated its indispensability, the Department is responsible for making certain that previous advances will be protected, and that there will be every opportunity for further expansion and progress.

The duties and accomplishments of the Aeronautics Branch have furnished an interesting subject for study. Although the viewpoint of the Federal Government now is somewhat different than in 1926, because of the fact that the Government is dealing with an established industry instead of a projected one, the Aeronautics Branch has followed up changes in trends as they occurred so that no abrupt revisions in general policy have ever been necessary, nor are any contemplated now.

I shall do everything in my power to make certain that the Department's activities in aeronautics will be continued as comprehensively and efficiently as in the past. This may be difficult of accomplishment because of the reduced appropriation for the next year, and it may be that some projects will have to be curtailed. However, I believe that it will be possible to hold expenditures down to the necessary level and still continue the work of the Aeronautics Branch without serious disadvantages to the aeronautics industry.

### James C. Edgerton

*Executive Assistant to the Assistant Secretary of Commerce*

THE future course of the Department of Commerce in regulation and promotion of aeronautics will be determined by trends in the industry itself. It has been the policy of the Federal Government to foster and encourage the development of flying, not to direct it, and the comprehensive system of air lines, miscellaneous flying services and manufacturing plants now comprising the industry were established upon the foundation of private enterprise.

Appointment of new officials for civil aeronautics activities of the Department of Commerce will not alter this fundamental principle. The work of the Aeronautics Branch will be adjusted to the needs and accomplishments of the aeronautics industry.

No detailed plans for the future activities of the Branch can be discussed at this time, for none have been definitely decided upon, other than to continue work now under way. However, some personal observations might be of interest:

For one thing, the future of flying depends upon the futures of the young men and women who now are beginning business and professional careers in aeronautics. Every effort should be made to assist these young people, and to attract other intelligent boys and girls to aeronautics. A direct move which might be made in this direction would be the organization of clubs which would enable them to learn to fly, to gain experience as pilots, and to familiarize themselves with other phases of aviation. This, of course, would be a project for private initiative, but one in which the Aeronautics Branch could be of assistance in many ways.

Another thought is with respect to regulations. These should be simplified and generalized wherever possible in order to give greater opportunity for development of originality and individuality. With due regard for safety, it seems probable that something can be accomplished in this direction.

In the field of research, I should like to see the consolidation of the various agencies of the Federal Government now engaged in these problems. Many research problems have been solved, and many more require early investigation, particularly in the field of aeronautic radio. These investigations must be undertaken in the most efficient and economical way that is possible.

The Federal Airways System has been reduced somewhat in mileage, and other economies have become necessary. For example, in many cases lights and radio stations are operated only when aircraft are known to be flying along the particular routes. I hope that the system now can be maintained without any further curtailments.

In general, and in all of its activities, I hope that the Aeronautics Branch will deserve and receive the closest co-operation of the areonautics industry. The Branch should be a clearing house for all problems affecting every phase of the art and business of flying, and should be in a position to serve the industry in virtually any circumstances that may arise.

### Eugene L. Vidal

*Director for Air Regulations*

WHILE the general policy and organization of the Aeronautics Branch is of such a nature that no radical changes could be contemplated, the Air Regulations Department should be sufficiently flexible so as to adjust itself to the expanding industry and its developments. The scheduled passenger operations and the air transport system have grown to such an extent that in order to afford the maximum assistance and uniform regulation for increasing safety factors, it is hoped that the inpsection and licensing work of that particular industry can be even more specialized and segregated. Private flying activities should increase at a rapid pace with the end of the general depression period and it is apparent that here a decentralizing of the present federal inspection and licensing system may be unavoidable in the near future.

The Air Regulations division will be concerned with assisting the air transport operators not only in establishing safety measures and standards, but also in co-operating in every way to the attainment of lower operating costs for the airline managements. The importance of this is fully appreciated.

In its relations with the manufacturers, assurance is given that whenever practical, good practice standards will be substituted for specified requirements, and, as in the case of operators, a policy of co-operation in decreasing production costs where safety factors are not jeopardized will naturally be followed. Simplification of ATC requirements and procedure can be expected.

As to private flying and school activities, it is felt that general interest should be accelerated at this particular time

since it is apparent that this phase of aviation will react to a surprising degree to business improvement.

The reduced appropriations for the Air Regulations Department should result in more increased efficiency rather than in any harmful restrictions of its present work.

## Rex Martin

*Director for Airways*

IN TAKING over the direction of the Federal Airway System I am impressed with the efficiency with which this great system presently operates, the magnitude of its construction, the competence of its personnel and the possibilities which exist for the future.

Although nearly 20,000 miles of airways are now in operation, it is perfectly evident that the task of construction is not yet complete. There are many blank spaces in the picture.

Technical advances in radio particularly, have already made obsolete, many existing aids. The new fog landing developments in radio mean not only the careful study of practical application, but a determination of policy regarding installation and use.

Intermediate landing fields spaced for 1928 flying equipment may not in many instances, adequately meet the requirements of 1933 equipment. Some may no longer be required, others may need improvement.

How to meet these changing conditions and maintain the existing airways on a very much reduced budget is the task that I face. I expect to meet it successfully. In this expectation, I feel confident of the unqualified support of the entire personnel of the Airways Division.

At the earliest possible time I shall inspect the entire system and meet those directly charged with its successful operation. Such projects as are being considered for future construction will be carefully studied with a view to their economic usefulness.

It should be obvious that with production being geared to 30 hours per week, transportation must be geared higher. This means just one thing, the airplane. No other means of transportation offers so much. To achieve the best possible results, certain new projects appear necessary, as well as a modernization of existing aids and equipment.

Present appropriations do not provide any funds for new construction or the modernization of existing equipment. An effort, however, is being made to secure funds from the Public Works Administration for these purposes. Should we be successful in securing such funds, expenditures will be made purely on the basis of planned economy.

In conclusion permit me to say that I offer the aviation industry assurance of my desire to co-operate fully in all matters that will advance the industry. In return I ask a similar measure of co-operation by the industry with those who will be serving with me.

## J. Carroll Cone

*Director for Aeronautic Development*

ACCOMPLISHMENTS standing to the credit of the Aeronautic Development Service of the Aeronautics Branch cover a wide range of activities related to flying. Some of them are achievements which will have a profound effect upon the future of air transportation, like the development of a radio system for blind landing of aircraft. Others are of a less spectacular nature, for in many of its activities the Aeronautic Development Service works behind the scenes.

Research on aids to air navigation and other problems relating to flying, dissemination of aeronautic information, publication of air navigation maps and fostering of airport development are the important phases of this service. All are vital to progress in the science and business of flying.

As the new Assistant Director for Aeronautic Development, I recognize that the industry has developed along lines which contemplate the need for these functions as now carried out. Consequently, there will be no radical departures from previous policies. As in the past, the Aeronautic Development Service will endeavor to co-ordinate its activities with those of the industry.

However, another factor has to be considered in plans for the immediate future—the reduced appropriation with which the Aeronautics Branch will have to work in the coming fiscal year. This difficulty, of course, is one which faces all other agencies of the Federal Government. With respect to the Aeronautic Development Service, it means that some projects will have to be reduced in scope or temporarily laid aside. It may mean that some research work will be discontinued but important investigations in aeronautic radio will be retained. A shortage of funds for printing has necessitated changing the Air Commerce Bulletin from a semi-monthly to a monthly publication. Notices concerning airports and airways formerly carried therein now appear in a weekly mimeographed bulletin bearing the title, "Weekly Notices to Airmen," which, incidentally, enables the Aeronautics Branch to make this important information available at more frequent intervals than in the past.

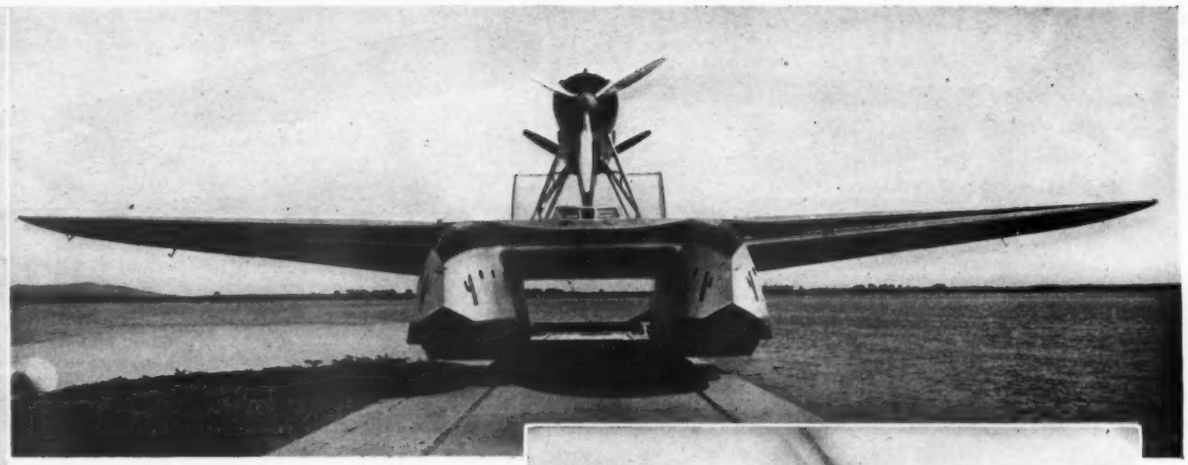
The activities of the Aeronautic Development Service have been important to the industry in the past, and they are far more so at this time, when the airlines, factories and other business organizations connected with flying have just passed through a period of trying economic difficulties. The Aeronautic Development Service will endeavor, in its promotional work, to play the same rôle during a period of economic recovery that it had first during a time of unparalleled business expansion, and later during a world-wide depression.

# Improved Safety Belts

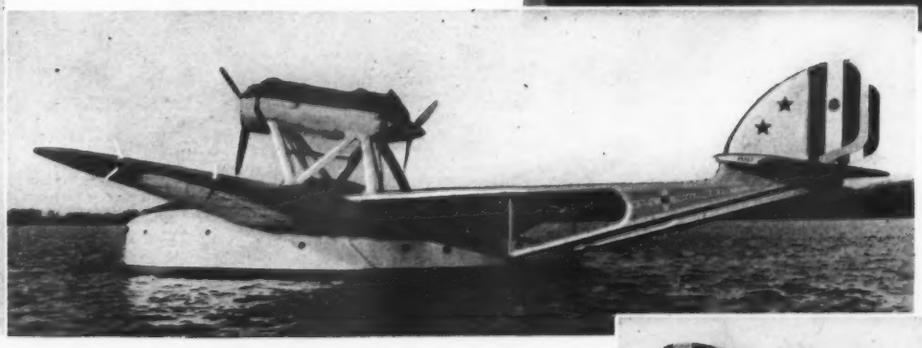
ONE of the minor annoyances with which passengers and operators have to contend is the safety belt. If the belt is too obvious or is too cumbersome, it is likely not only to cause annoyance, but to have a bad psychological effect. Since passengers vary greatly in overall dimensions, some form of quick adjustment of tension must be provided, but the standard open cockpit type safety belt with its multiplicity of straps and trick latches falls wide of the mark for transport use.

Officials of Transcontinental and Western Air, Inc., have done some intensive work on the problem, and a new type of belt has been evolved under the supervision of W. A. Hamilton, superintendent of maintenance, which is now undergoing active service testing in one of T.& W.A.'s ships. As indicated in the accompanying photograph, the latching arrangement is attached to the opposite side of the chair frame. The passenger, once seated, simply inserts the strap through the fastener, pulls it down to the desired tension and releases it. An eccentric cam wedges the strap firmly in place so that it cannot be withdrawn. To release himself, the passenger merely pushes the plunger button on the left arm of the chair and then stands up.

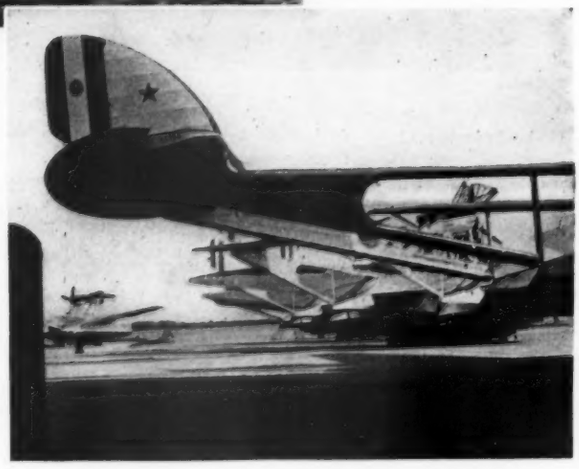
The advantages of such a belt are obvious. There are no buckles to be sat upon inadvertently, or to be fumbled with by unaccustomed hands. The adjustment to the individual user is instant and automatic, and the release mechanism is quick acting and conveniently located. The appearance of the seat is improved by the elimination of loose ends of straps and webbing.



The leader, Air Minister Italo Balbo.



Backbone of Italy's flying fleet, the S55X. Above: Fifteen hundred horses champ at the bit. Left: An anchorage in home waters. Below: On the ramp at Orbetello.



# Visitors from Italy

## A peaceful invasion by Il Duce's squadrons

**Land planes for reconnaissance or light bombing. Above, left: R-3, all-metal two-seater with 450-hp. water-cooled LD engine. Above, right: R-5 two-place sesquiplane of composite construction with M17 engine.**

**Heavy-bombers. Above: The twin-engined (M17-powered) TB-1 in modified form was flown from Moscow to New York in 1928. Right: A sesquiplane bomber,—the TB-2, with engines mounted on the lower wing and machine guns in the rear of the nacelles as well as in the fuselage.**

**Pursuit group. Above, left, Monocoque plywood construction is used in the fuselage of the I-2bis (650 hp. M17). Above, right: The I-3 (M17). Extreme left: An all-metal design,—the I-4 with M22 air-cooled engine. Left: The I-6 with supercharged M15 engine resembles the British Bristol Bulldog.**

**Two-seater pursuit ships. Above, left: An early type, the DI-2 (M17), with monocoque fuselage and rectangular wings. Above, right: An improved type, the DI-3 (M17) with welded steel tube fuselage. Vertical tail surfaces are spread far apart to increase range of fire and the retractable radiator of the DI-2 has been replaced by one of the tunnel type.**

**Along with the vast program of industrialization in Russia is the equally important problem of providing adequate defenses for a territory of tremendous size. While it is common knowledge that much energy is being devoted to the upbuilding of the Soviet Air Forces, detailed information is extremely scarce and most of it is flavored with personal opinion or impressions gained in limited observation. We are particularly fortunate in having for the author of this article of our military series a man whose association with Russian aeronautics dates back to the early years of the Soviet Government and who is taking an active part in its development at the present time.**

# The equipment of air forces

## THE UNION OF SOVIET SOCIALIST REPUBLICS

*By Arthur A. Adams*

***Board of Directors, United Aircraft Industries of the U.S.S.R.***

AIRCRAFT played an insignificant rôle in the activities of the Russian armies during the World War. The development of the armed air forces of the U.S.S.R. began in the year 1921. Prior to that time the armed air forces of the Soviet Union were largely composed of types of imported planes and some trophies captured from invading armies during the Civil War.

The types of planes described in this article are classified as follows: R—Reconnaissance Planes and Light Bombers, TB—Heavy Bombers and Torpedo Carriers, I—Pursuit Planes, DI—two seater Pursuit Planes, MR5 and MDR—Reconnaissance Seaplanes and U and MU—Training Planes for land and sea.

### *Construction materials*

Kolchug-aluminum, an aluminum alloy of the duralumin type, developed in the U.S.S.R. is one of the most widely used materials in aircraft construction. It differs from the conventional duralumin used elsewhere by the presence of some nickel and possesses certain properties that make the Russian designer prefer it to ordinary duralumin. Properly coated, Kolchug-aluminum possesses higher anti-corrosion qualities. Its tensile strength is 96,500 lb. per sq.in. with an elongation of 14 per cent good machinability, and it requires very simple processes for aging, etc.

Siberian aviation pine—a timber with a specific weight of .062 dominates in aircraft of composite design where wood is also specified, satisfactorily replacing the well known spruce used in American practice.

Welded fuselages are common Chrome molybdenum and other steels including stainless, as well as magnesium alloys of the Electron type are used in their construction.

### *Reconnaissance land planes*

Airplanes of the R class are used for land reconnaissance and for light bombing. They have either wheel or float landing gears which permit their use for land and sea reconnaissance. Such types are well known in aviation circles. Their chief characteristics are outlined in Table 1.

The R-3 plane with 450 hp. water-cooled LD engine, is a two seater biplane used for land reconnaissance or light bombing. It is an all-metal plane constructed mainly of Kolchug-aluminum, although some steel is used.

All the piloting devices and engine controls are concentrated in the front cockpit. The left side of the fuselage carries a stationery machine gun, firing through the propeller and operated by the pilot.

The rear cockpit is for the observer. It also carries control stick, navigating and engine control instruments, photographic installations, bomb release, turret with two joined machine guns and signaling devices (rocket pistols). The cross-section of the fuselage is triangular with bulging sides and apex downward.

The cellule is composed of upper and lower wings of an original profile known as the "ANT." Both upper and lower wings are rectangular with rounded tips.. The span and chord of the lower wing are smaller than those of the upper. The wings are braced externally with Y-shaped struts and streamlined wires. The upper wing alone has ailerons. The tail group consists of a stabilizer, balanced elevator and rudder. Horn type compensation is used exclusively. Corrugated aluminum covering is used for the fuselage, wings, stabilizers and rudders.

The landing gear is composed of two separate axles each with two struts, forming a triangular pyramid with downward apex. The upper ends of the split axles are hinged into one joint of the lower longeron of the fuselage. Axles and struts are of steel tubing.

The R-5 plane with 650-hp., water-cooled M17 engine is a two seater sesquiplane.

This plane is equipped and armed for land reconnaissance and light bombing service for day and night flying.

The R-5 is built of metal and wood having a fuselage of rectangular cross-section with semi-circular convex upper surface. The wings are rectangular in plan form with rounded elliptical tips. The upper wing has the larger span and the cellule is characterized by negative stagger. Upper and lower wings are braced by a pair of N struts and wires.

All the surfaces and the fuselage are fabric covered excepting the front part which is covered with Kolchug-aluminum. The landing gear is metal with rubber shock absorbers on the forward struts.

Cockpits for the pilot and the observer are in tandem with the pilot's cockpit forward.

Balanced ailerons are found on the upper wing only. Stabilizers and rudders are of the conventional type.

**Table 1: Weights and sizes of reconnaissance planes**

| | R-3 with LD engine | R-5 with M17 engine |
|---|---|---|
| Gross weight (lb.) | 4,620 | 6,160 |
| Weight empty (lb.) | 3,058 | 4,213 |
| Total load (lb.) | 1,562 | 1,947 |
| Load (lb. per sq. ft.) | 11.6 | 11.2 |
| Load per horsepower (lb.) | 10.3 | 10.3 |
| Upper span (ft.) | 43.3 | 50.9 |
| Lower span (ft.) | 31.5 | 39.4 |
| Length (ft.) | 32.4 | 34.7 |
| Height (ft.) | 9.9 | 11.8 |
| Total load-carrying area (sq. ft.) | 398.3 | 540.4 |

**Table 2: Performance of reconnaissance planes**

| | R-3 with LD engine | R-5 with M17 engine |
|---|---|---|
| Maximum speed, sea level (m.p.h.) | 140 | 153 |
| Maximum speed, 13,120 ft. (m.p.h.) | 129 | 141 |
| Landing speed (m.p.h.) | 56 | 58 |
| Climb to 13,120 ft. (min.) | 20.4 | 15.4 |
| Service ceiling (ft) | 19,685 | 21,300 |
| Range (miles) | 434 | 682 |

### *Bombers*

Multi-engine planes classified "TB" compose this group. The Soviet aircraft industry has produced the following types of heavy bombers: TB-1 with two M17 engines. TB-2 with two M17 engines.

The TB-1 with two M17 water-cooled engines is intended for heavy bombing or for use as a torpedo carrier. Its landing gear can be replaced by floats.

In design the TB-1 is an all-metal cantilever, low wing monoplane. Kolchug-aluminum is used for the construction of the entire plane, excepting the landing gear, engine mounting and certain joints.

Two 650-hp. water-cooled M17 engines compose its power plant. These are placed in front of the wings on either side of the fuselage and are equipped with tractor propellers.

The crew numbers six: two pilots, a bomber and three observers. The foreward part of the fuselage carries a turret with two machine guns for the front observer. Next comes the bombing station concentrating all the bombing equipment, sighting, releasing, etc. Dashboards with instruments for the engines are located behind the pilots' cockpits as well as passages into the wings used to tend the fuel tanks and engines. A bridge from the passageway between the pilots' cockpits leads to the rear of the fuselage connecting the pilots with the central and rear observers. The bridge passes between bomb racks of cassette type located in the sides of the central section of the fuselage. The central and rear observers each have a turret with two jointly mounted machine guns. Both turrets are of the revolving type and swing to either side of the fuselage.

The wing consists of a center section integral with the fuselage and two detachable panels. Both front and rear sections of the fuselage are detachable and are bolted to the central part. Front and rear of the center section are also detachable to facilitate transportation, installation of the fuel tanks, servicing, etc.

The landing gear has two separate axles. The long end of each member of the divided axle inclines upward and is hinged to the bottom of the fuselage. The short, horizontal end of each axle which carries the wheel is attached with the aid of cord shock absorbers to the supporting girder of the landing gear placed vertically in the plane of the corresponding engine. The upper ends of the struts are fastened at the lower wing surface.

Rudder and stabilizer are adjustable and of conventional type. Two tubular steel struts brace the stabilizer from underneath. Landing gear can be replaced with floats supported by a system of struts which may be attached to the lugs provided at the lower surface of the center section.

The TB-1 type plane with 2BMW-6 engines, modified for civilian flying is known to the American public in consequence of its Moscow-New York flight in 1928 as the "Strana Sovietov" (Land of the Soviets).

The TB-2 with two M17 engines represents the heavy bomber class. This plane is of composite construction with its fuselage of chrome-molybdenum steel tubing, its lower wing of Kolchug-

**Table 3: Weights and sizes of bombing planes**

| | TB-1 with two M17 engines | TB-2 with two M17 engines |
|---|---|---|
| Gross weight (lb.) | 15,004 | 14,674 |
| Weight empty (lb.) | 5,540 | 4,950 |
| Total load (lb.) | 9,464 | 9,284 |
| Load (lb. per sq. ft.) | 12.0 | 10.8 |
| Load per horsepower (lb.) | 12.5 | 12.4 |
| Span (ft.) | 89.9 | 88.6 |
| Length (ft.) | 59.1 | 57.8 |
| Height (ft.) | 20.0 | 20.7 |
| Total load carrying area (sq. ft.) | 1,246.5 | 1,377.8 |

**Table 4: Performance of bombing planes**

| | TB-1 with two M17 engines | TB-2 with two M17 engines |
|---|---|---|
| Maximum speed, sea level (m.p.h.) | 130 | 134 |
| Landing speed (m.p.h.) | 56 | 53 |
| Climb to 9,840 ft. (min.) | 15.6 | 12.0 |
| Service ceiling (ft.) | 18,040 | 16,400 |
| Range with 2,200-lb. bomb load (miles) | 1,115 | 742 |

**Table 5: Weights and sizes of pursuit planes (single seaters)**

| | I-2 bis | I-3 with M17 engine | I-4 with M22 engine |
|---|---|---|---|
| Gross weight (lb.) | 3,414 | 3,542 | 2,882 |
| Weight empty (lb.) | 2,534 | 2,563 | 1,903 |
| Total load (lb.) | 880 | 979 | 979 |
| Load (lb. per sq. ft.) | 11.8 | 11.8 | 11.2 |
| Load per horsepower (lb) | 8.5 | 5.9 | 6.0 |
| Upper span (ft.) | 35.4 | 36.4 | 37.4 |
| Lower span (ft.) | ..... | 29.5 | ..... |
| Length (ft.) | 24.0 | 26.5 | 23.9 |
| Height (ft.) | 9.8 | 11.0 | 9.2 |
| Total load-carrying area (sq. ft.) | 288.5 | 299.9 | 256.2 |

**Table 6: Performance of single seater pursuit planes**

| | I-2bis | I-3 with M17 engine | I-4 with M17 engine | I-6 with M15 engine |
|---|---|---|---|---|
| Maximum speed sea level (m.p.h.) | 150 | 168 | 183 | 199 |
| Maximum speed 16,400 ft. (m.p.h.) | 134 | 186 | 180 | 208 |
| Landing speed (m.p.h.) | ... | 62 | 61 | 65 |
| Climb to 16,400 ft. (min.) | 17.4 | 9.25 | 8.5 | 8.0 |
| Service ceiling (ft.) | 20,300 | 23,600 | 26,900 | 29,500 |

**Table 7: Weights and sizes of two-seater pursuit planes**

| | DI-2 with M17 engine | DI-3 with M17 engine |
|---|---|---|
| Gross weight (lb.) | 4,206 | 4,019 |
| Weight empty (lb.) | 2,963 | 2,776 |
| Total load (lb.) | 1,243 | 1,243 |
| Load (lb. per sq. ft.) | 12.3 | 12.5 |
| Load per horsepower (lb.) | 7.0 | 6.7 |
| Span (ft.) | 38.7 | 38.1 |
| Length (ft.) | 26.9 | 26.2 |
| Height (ft.) | 10.8 | 10.8 |
| Total load-carrying area (sq. ft) | 342.3 | 322.9 |

**Table 8: Performance of two-seater pursuit planes**

| | | |
|---|---|---|
| Maximum speed, sea level (m.p.h.) | 159 | 169 |
| Maximum speed, 16,400 ft. (m.p.h.) | 168 | 176 |
| Landing speed (m.p.h.) | 62 | 61 |
| Climb to 16,400 ft. (min.) | 14.2 | 13.6 |
| Service ceiling (ft.) | 23,000 | 25,600 |

aluminum and its upper wing of wood.

TB-2 is a typical sesquiplane with its upper wing placed high above the fuselage and the engines placed on the lower wing stubs on either side of the fuselage. The external wing bracing consists of two pairs of inclined struts. Two other pairs of struts connect the engine mounts to the upper longeron of the fuselage and to the spars of the upper wing. Two machine guns to cover the rear semi-sphere are installed on the lower wing at the rear of the engine nacelles. The front and rear of the fuselage have turrets with double machine guns. For better visibility in bombing the lower front end of the fuselage is glazed. Landing gear, rud-

ders and stabilizers are of conventional type.

### *Pursuit planes*

Pursuit planes classified as "I" compose this group. Pursuit planes with more than two cockpits known as MI air cruisers are used by the armed air forces of the U.S.S.R. Information for publication on these planes is not available at the present time. The armed air forces of the U.S.S.R. have consecutively employed and are now employing the following types of pursuit planes: I-2bis; I-3 with M17 engine, I-4 with M22 engine, I-6 with M15 engine; DI-2 and DI-3.

I-2bis is a biplane of composite construction with 420 hp. water-cooled M5 engine. The wing cellule consists of a high upper wing and two lower wing panels joined by X-shaped struts and braced with streamline wires. The fuselage is of monocoque type built up of plywood. The plane is armed with two stationary machine guns firing through the propeller.

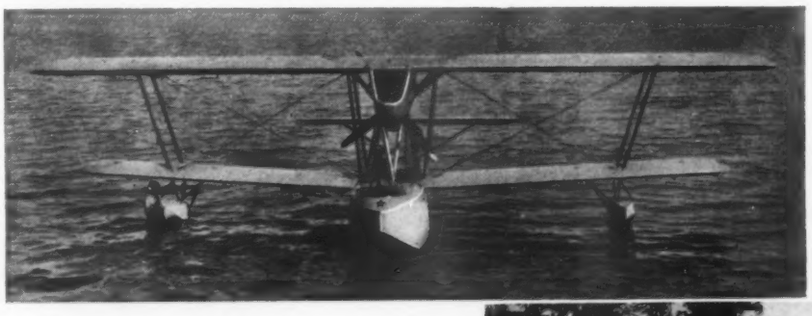
The type I-3 with a 650 hp. water-cooled M17 engine is a sesquiplane of composite construction with spindle shape fuselage cross-section. The wings are rectangular in plan form with rounded tips and fabric covered. Upper and lower wings are braced by a pair of N-shaped struts and streamlined wires. The wings are staggered positively. The upper wing span is greater than that of the lower. The landing gear is of metal with rubber shock absorbers on the front strut and is slightly ahead of the center of gravity of the plane. The pilot's cockpit is located in the center of the fuselage.

The I-4 plane with a 480-580 hp. air-cooled engine is a single seater sesquiplane. The plane is built of Kolchug-aluminum with the exception of the landing gear and certain parts. Corrugated Kolchug-aluminum is used to cover the wings, fuselage, stabilizers and rudders. The span of the upper wing is considerably larger than that of the lower wing which is attached by a pair of Y-shaped struts.

The I-6 plane has a supercharged, air-cooled 525-625 hp. engine—M15. This plane is of composite construction with a monocoque type fuselage of oval cross-section and built up of plywood. N-shaped struts and streamlined wire bracing is used.

The DI-2 plane with M17 engine is a two seater biplane of composite construction. Its fuselage is monocoque type, of oval cross-section. The wings are rectangular in plan form with rounded tips and joined by N struts and streamline wire bracing. The rear cockpit for the observer is fitted with two joined machine guns on a turret.

The DI-3 plane with M17 engine is likewise a two seater biplane of composite construction, but an improvement on the preceding type DI-2. The fins and rudders are spread apart from the longitudinal axis of the plane to improve firing range in the rear semi-sphere. The retractable radiator of DI-2 has been replaced by a tunnel type radiator with shutter. The fuselage is made of welded chrome molybdenum



**Reconnaissance seaplanes. Above: A four blade pusher propeller is used on the MR-5 (M17), which has Kolchug-aluminum hull and wooden wings and floats. Right: For the open sea—the MDR1 "ROM" with two M17 engines. Below: Aluminum and steel are used throughout the construction of the MDR-2 long distance type.**

**Training planes. Below, left: The U-2, with 100 hp. air-cooled M-11 engine is available with landing gear or as a single float seaplane. Below: A special arrangement is made for ground handling gear in the MU-2 design. The M11 engine is the power plant and Kolchug aluminum is used in the hull construction.**

tubing. DI-3 in the illustration is shown in winter service on skiis.

### *Reconnaissance seaplanes*

Earlier in this article mention was made of the fact that land planes mounted on floats are used for sea service. This section is devoted exclusively to planes especially designed for such service.

The MR-5 with M17 engine is a flying boat with floats on the lower wing mounted under the wing struts. Kolchug-aluminum is used for making the hull, center-section, stabilizers and rudders; the wings and wing floats are made of wood. Wings are covered with plywood. The engine is placed between the boat and the center section and is equipped with a four-blade pusher type propeller. The hull is of the double keel type. Non-sinkability is assured by seven watertight compartments and in addition the front compartment of the boat has a watertight bottom and side air chambers.

The MDR-1 "ROM" with two M17 engines is intended for open sea reconnaisance. It is a sesquiplane with metal hull. Its upper wing is made of wood and covered with plywood.

The lower wing which has a very small span (21.6 ft.) is joined to the upper wing by inclined struts. To ensure cross or side buoyancy small floats are placed at the ends of the lower wing. The upper wing is placed above the boat and the two M17 engines with tractor propeller are placed on its center section. The hull is of double keel construction.

The MDR-2 plane with 2 M17 engines is also a long distance reconnaissance sea boat. This is a monoplane with its wings directly attached to the upper part of the boat. Its two engines are placed on top of the wing on struts and are equipped with pusher propellers. Kolchug-aluminum is used throughout excepting for several steel parts; the boat bottom is built of steel.

**Table 9: Weights and sizes of reconnaissance seaplanes**

| | MR5-with M17 engine | ROM-11 | MDR-2 |
|---|---|---|---|
| Gross weight (lb.) | 6,780 | 13,200 | 15,400 |
| Weight empty (lb.) | 4,459 | 8,131 | 9,504 |
| Total load (lb.) | 2,321 | 5,069 | 5,896 |
| Load (lb. per sq. ft.) | 11.9 | 11.4 | 17.1 |
| Load per horsepower (lb.) | 11.3 | 11.0 | 12.8 |
| Upper span (ft.) | 51.2 | 87.9 | 76.1 |
| Lower span (ft.) | 44.8 | 21.7 | .... |
| Length (ft.) | 37.6 | 65.0 | 60.7 |
| Height (ft.) | 14.1 | 23.6 | 24.6 |
| Total lead - carrying area (sq. ft.) | 570.5 | 1162.5 | 904.2 |

**Table 10: Performance of reconnaissance seaplanes**

| | MR-5 | ROM | MDR-2 |
|---|---|---|---|
| Maximum speed, sea level (m.p.h.) | 140 | 134 | 135 |
| Maximum speed at 9,840 ft., (m.p.h.) | 129 | 123 | 124 |
| Landing speed (m.p.h.) | 54 | 61 | 53 |
| Climb to 9,840 ft. (min.) | 12.6 | 18.3 | 16.4 |
| Service ceiling (ft.) | 17,100 | 15,750 | 16,400 |
| Range (miles) | 434 | 744 | 930 |

### *Training planes*

Two types of training planes are used: the U-2 with 100 hp. air-cooled M11 engine, a land type and the MU-2 with M11 engine—sea-going. The former can also be used with floats.

The U-2 with M-11 engine is a biplane with rectangular wings rounded at the tips and braced by N struts. Its upper wing is of the parasol type and joined to the fuselage by a pair of N struts. The landing gear is like those previously described. This plane can be placed on a landing gear consisting of a single float and two additional small floats placed on the lower wing.

The type MU-2 is a flying boat biplane with floats on its lower wings and is equipped with a 100 hp. air-cooled M11 engine. Kolchug-aluminium is used for its construction, with the exception of the wings and floats which are of wood.

The boat has a single keel. The plane is equipped with facilities for moving in the hangar.

**Table 11: Weights and sizes of training planes**

| | MU-2 with M11 engine | U-2 with M11 engine |
|---|---|---|
| Gross weight (lb.) | 1,892 | 2,202 |
| Weight empty (lb.) | 1,331 | 1,637 |
| Total load (lb.) | 561 | 565 |
| Load (lb. per sq. ft.) | 5.3 | 5.8 |
| Load per horsepower (lb.) | 18.9 | 22.0 |
| Upper span (ft.) | 37.4 | 38.7 |
| Lower span (ft.) | 37.4 | 38.7 |
| Length (ft.) | 26.7 | 25.9 |
| Height (ft.) | 9.5 | ..... |
| Total load-carrying area (sq. ft.) | 356.8 | 383.8 |

**Table 12: Training plane performance**

| | U-2 with M11 engine | MU-2 with M11 engine |
|---|---|---|
| Maximum speed, sea level (m.p.h.) | 96 | 84 |
| Landing speed (m.p.h.) | 43 | 46 |
| Climb to 9,840 ft. (min.) | 20.0 | 46.0 |
| Service-ceiling (ft.) | 13,120 | 11,470 |

## Airport lighting control desk

HIGH UP in the tower of the administration building of Pittsburgh's new Allegheny County Airport the dispatcher sits at a desk that gives him almost finger-tip control of the arrival and departure of planes. At the top of the desk is a miniature layout of the run-way system, complete with lights, with a wind indicator set in flush with the surface. Immediately below are the control switches. Incoming and departing planes receive authorization to land or to take-off from a signal "gun" shown in the upper left-hand corner. The proper runway is designated by lights, green on one end, amber on the other. Landings are made from green to amber. All boundary, obstruction and floodlights are also controlled from the dispatch board in the dispatcher's tower. Westinghouse made the installation.

**An account of the servicing and supply activities of Pacific Airmotive Corporation, Ltd.**

# A West Coast servicing unit

RANKING as one of the larger independent commercial aviation organizations in the country, Pacific Airmotive Corporation, Ltd., incorporates within one plant at its United Airport (Burbank, Cal.) headquarters a supply service covering many brands of engines, parts, and accessories; a factory repair service including four complete lines of engines; and an aircraft repair service on airplanes and parts, including Hamilton-Standard propellers, and Bendix wheels and brakes. Licensed by the Department of Commerce under repair certificate No. 88 for all types of repair work, complete service is available to private operators of aircraft, to industrial plane owners and to fixed base operators in the Southern California area. Engine overhaul work as well as service on wheels, brakes and propellers is also performed for several major air transport operators.

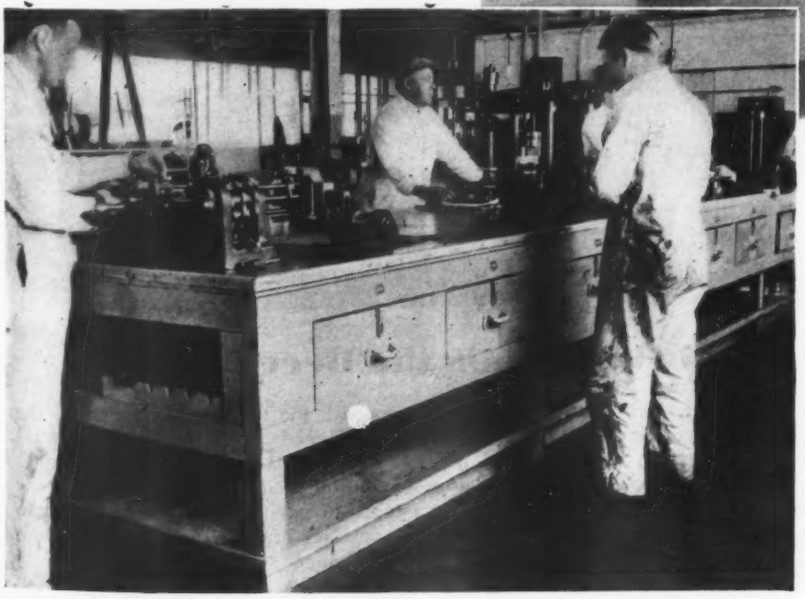
In its organization and operation Pacific Airmotive was planned at once to provide factory service on equipment without undue cost or duplication of effort by the manufacturers, and to make the best type of service available to the casual flyer.

Despite the wide variety of planes in transport use, the units which require the most service and overhaul (such as engines, instruments, propellers, etc.) have been fairly well standardized. Thus it becomes practicable for a single central repair depot to equip for complete factory servicing on such equipment and to render service to all operators in a given territory at a much lower cost than might otherwise be possible.

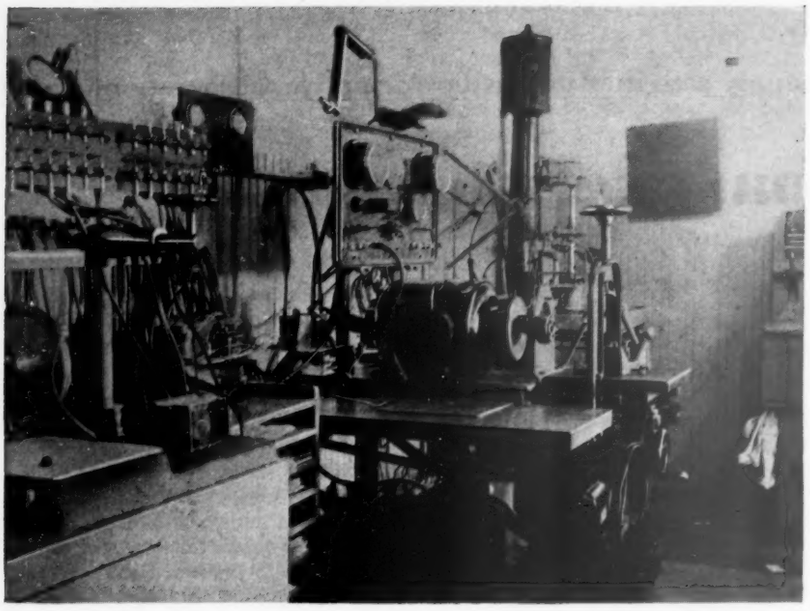
The Pacific Airmotive base at United Airport includes a complete engineering department. The total mechanical equipment provided is valued at approximately $60,000 with an additional $15,000 invested in company delivery cars, planes, etc. The investment in parts stock totals about $90,000 and includes the provision of more than 6,000 different items.

### *From a modest beginning*

The company started business late in 1927 with a staff of six people and a building of some 5,000 sq.ft. of floor space located in West Los Angeles—near, but not on, an airport. Among the original items represented were Wright Whirlwind engines, Scintilla magnetos, Stromberg carburetors, and miscellaneous supplies. In 1929 the company was reorganized under California laws with its present name, and in August, 1930, the operating base was moved to Los Angeles Airport where a new hangar building and shop headquarters had been erected with a total floor space of about 27,000 sq.ft. During 1930 a branch shop and service center was established, at Oakland airport, and three affiliated service stations were authorized in the State of California. In 1931, the company equipped for Kinner engine service and in October of that year, was appointed factory sales and service representative for Pratt & Whitney, and Warner engines, and for Hamilton-Standard propellers. At that time the headquarters was moved to United Airport, Burbank, where a hangar and shop building with



**Portion of engine repair shop. Above: Pacific Airmotive stockroom and retail store**



**Apparatus for overhaul and test on carburetors, magnetos and electric equipment.**

36,000 sq.ft. of floor area was taken over. The total personnel at the Burbank base is now 46 persons, including 19 men in the engine shop, 9 in the aircraft repair department, 3 in the propeller repair department, and others in stockroom, office, sales and miscellaneous work. Present officers of the company are: W. E. Thomas, president and general manager; Palmer Nicholls, vice-president, in charge of sales.

### *Serving eight states*

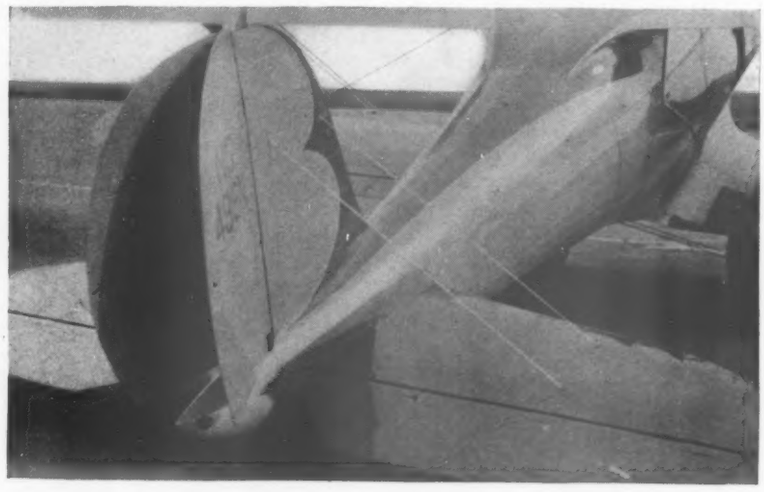
The territory served by the Pacific Airmotive Corporation, Ltd., includes roughly, the eight western states: California, Arizona, Nevada, Utah, Idaho, Montana, Washington, and Oregon. In addition to the headquarters at United Airport there are now two branch stations equipped for service and supply, one at Los Angeles Airport and the other at the Oakland Airport. Hangar service and storage, and general repair and supply service are available at all three places, althougth the majority of heavy overhauling is performed at the United Airport base. Besides these three stations there are four approved service and supply bases operating as parts and supply dealers under the Pacific Airmotive Corporation; San Diego Air Service, San Diego; Santa Maria Airlines, Santa Maria; Northwest Air Service, Seattle; and National Parks Airways, Butte, Montana. A stock of parts is maintained at all of these points and general service is available. The total business done by this organization in 1931 approximated $250,000. An increase of 18 per cent over this figure was shown for 1932.

The fullest co-operation has been given by all manufacturers concerned in the development of all servicing functions. Equipment has been installed that conformed fully with factory requirements, and factory men have been employed, or have been obtained temporarily to give P.A. employees training in specialized methods.

### *Equipment*

The plant equipment includes a complete outside cleaning plant for engine parts, a sandblasting machine, an automatic bake oven for enameled parts, an automatic oil bath tank for tempering metal parts, a 60-ton hydraulic press for straightening propellers, propeller etching tanks, complete propeller grinding and polishing equipment, and a machine shop that is completely equipped with everything needed for engine overhaul. An example of certain highly specialized equipment on hand is a fixture developed in the Burbank plant for boring center and rear main bearings of Wright Whirlwinds which proved so successful that the Wright Aeronautical Corporation adopted it as a standard tool and has listed it in their tool catalog. Other special equipment in the engine shop includes a crankshaft vise developed in the local shop for all Pratt & Whitney and Wright Whirlwind engines, a Wadell Universal Connecting Rod Boring Fixture capable of boring master and articulating rods for all radial or vee type aircraft engines to an accuracy of 0.0001 in., a Rockwell hardness tester, and a press for installing knuckle pins on the rod assembly of Pratt & Whitney engines.

Among the tools for accessory repair there is equipment for testing carburetors and electrical apparatus. A special Bendix brake drum installation jig is used in the wheel and brake department. Recently a dope shop has been added—5,000 sq.ft. of space in a detached fireproof building, equipped with air conditioning apparatus which maintains a constant room temperature of 90 deg. and changes the air every three minutes.



## Air brakes on the Beechcraft

IN DISCUSSING Walter Beech's newest airplane (AVIATION, December, 1932), mention was made of the split rudder used to increase parasite drag in order to make slow landings at deep angles. The accompanying photograph shows the rudder in the open position, and indicates how normal directional control can be maintained even with the flaps open because of the double-hinged mounting. The picture reveals also a number of interesting streamlining details, particularly the method of fairing the biplane wings into the fuselage and the method of reducing the fuselage section for detail. Note also the high aspect ratio of the stabilizer and the narrow elevator chord.

# The brake pedal problem

## A few principles for foot pedals that may aid in standardizing their design

*By Alfred H. Hofer*

*Variety Manufacturing Company*

THE application of brakes and brake pedals has been the cause of numerous headaches to airplane manufacturer and to designer of wheels and brakes alike. As a matter of fact, airplane brakes are simple enough. They may be installed readily and operated efficiently when fitted properly into the design. Difficulties have arisen chiefly from a lack of understanding between the manufacturers and the users.

Much of the trouble centers around the design of the footpedal. It happens that this particular item lends itself most readily to standardization, for, after all, the amount of pressure which a pilot can exert with his foot is almost a fixed figure. To lay down a few principles for pedal design may serve to reduce the correspondence necessary between the airplane and the brake manufacturers.

Perhaps a brief history of the development of brakes might serve as a point of departure for the discussion. Strange as it may seem, the parachute is really responsible or the airplane brake—being the indirect cause of the design and application of the first brakes at McCook Field. A plane was testing parachutes, and the pilot spent all day loading dummies, climbing to a proper altitude and dumping them. At every landing the long roll wasted valuable time which might have been spent in taxying back for another load. Somebody wished for brakes, and the writer was given the job of designing and building the first set, largely because he had designed brakes for exhibition planes before the War. In these early brake arrangements the pedals were independent of the rudder bar. The McCook idea was to combine the rudder bar and the brake pedal.

The first pedal was applied directly to rudder bar and was actuated by the toe. This method was not long in use, because it was almost impossible to apply the brake with the foot which was farthest forward, as the foot tended to slip off the pedal in that position. Flanges helped the slipping somewhat, but the arrangement was very awkward at best. In building the first set it was found that many of the difficulties of the straight type could be overcome by curving the pedal. Thus, the top edge of the pedal became another foot rest, actuating the brake and steering at the same time. The pilot did not have to reach so far forward with his foot.

The McCook Field experiment soon found the stirrup type of pedal to be the most suitable. The motion forward and back in the same plane avoided the tendency of the foot to slip off to one side, and it was almost as easy to apply force in the far forward position as in any other. Another advantage of the stirrup type is that it occupies less space in a crowded cockpit. It may be applied easily under an instrument board, and is compact, saving both vertical and horizontal space. When hinged properly, it is possible to apply either brake at full force without requiring much pressure on the opposite rudder. This may not seem important, but brakes are needed at times of stress, when the pilot is very busy, and every difficulty that can be removed from his consideration by the designer will pay dividends in safety.

### *Toe or heel*

The question soon rose, however, as to whether the toe or the heel should be used in applying the brake. The toe method was the favorite, because greater movement is possible, and the motion seems more natural. In general, the toe pedal is least in the way of plane operation when the brake is not in use. To get the heel pedal out of the pilot's way, it is necessary to place it on one side or in the center of the stirrup. In such a position it may frequently be struck unintentionally, and the heel must be swung around the side to get out of contact with it.

Since the longest foot pedal is 7 or 8 in., and the lever at the brake rarely more than 3 or 4 in. in length (shorter ones preferred), it is possible to get a leverage ratio of about 3:1, a desirable figure. Army specifications finally boiled down to an allowed movement of 1 in. on small brake levers and 2 in. on larger brakes. Thus, the travel of the pedal in the cockpit must be 3 to 6 in. It is difficult to get that much travel when the pedal is heel-operated. It has been found that 6 in. is the maximum for comfortable toe action.

As to the force required, the Army originally set a maximum of 700 lb. pressure on the lever at the brake. It was estimated at that time that the average man could exert 200 lb. on the brake pedals with his feet. This was much more force than is needed in most cases, but it was a convenient maximum figure for use by manufacturers of brakes.

### *Braking power*

Since the coefficient of friction of a tire on the ground is about 50 per cent, each brake would be required to hold a load (tangent to the tire) of 25 per cent of the weight of the airplane. Thus, for a plane weighing 3,000 lb., equipped with a set of 8.50x10 wheels, each brake would be required to hold 750 lb. pull, tangent to the tire. A force of 450 lb. on the brake lever will hold this load, and with a brake pedal ratio of 3:1, the force required of the pilot to slide the tires on the ground would be 150 lb. Since the thrust of the propeller, with engine wide open, is only 4 lb. per horsepower, it requires but a small part of the braking power (about a third of the maximum on the average) to hold the plane when running up the engine.

The original tests on brakes were static tests. At the present time, Wright Field is testing also by means of a dynamometer. The wheels are driven from 10 to 60 m.p.h. by large electric motors and varying loads (from 50 lb. to 250 lb.) applied to the brake lever. A scale shows the amount of braking. The maximum load now applied to brake levers is 250 lb.

The above figures are for military planes. Although commercial planes need not adopt military standards, their requirements are excellent guides for the civilian designer. For smaller ships that require much less braking power, wide departure may be made from military standards.

# EDITORIALS

AVIATION

EDWARD P. WARNER, *Editor*

## Not so quiet along the Potomac

EVERY AIRSHIP is entitled to a shakedown cruise, and every airplane to a series of test flights, before its performance is formally judged. The administration in Washington has now passed through the shakedown period. Its purposes are defined. Its courses are set. They will be changed from time to time, but the general policies which President Roosevelt and his co-workers seek to promote, and the sort of a country which they seek to create, are now reasonably clearly apparent.

Furthermore we have entered the new fiscal year, the first in which the planning of the new administration could have any pronounced effect. No sooner were the new forces in power in Washington than they began to shape their plans for a re-arrangement of the Government's spending, and a reorganization of the departments that do the spending, immediately after July 1. We have reached that date, and the results of the planning have begun to be apparent. Now, for the first time, it is fair to appraise the effect of Democracy's access to power upon American aviation.

Five months ago, in our Record-of-Progress issue, we addressed to the new President and his associates and to the new Congress a pictorial presentation and an appeal. The presentation was of the present state of American aviation and of the spectacular progress that it had made over the past few years. The appeal was for fair governmental treatment of the aeronautical industry and of the operators of aircraft, in order that the ground that had been so brilliantly gained might not be lost. Five months have passed, and now we can see what has happened.

When we look along the air lines and into the aircraft factories there is plenty of occasion for enthusiasm. The record of progress that was recited last March has been piled higher and higher with new achievements since that time. New planes and new accessories have made air transport more comfortable, more safe, more swift, more reliable, *and more popular*. Records for intercity speed have been broken repeatedly, and records for passenger and express traffic have been broken by even larger margins. But when we turn away from current operation and look to the capitol of the nation, there is less occasion to be cheerful.

WE DISCOVER with distress and with alarm that the drive for economy has bitten more deeply into aviation than into almost any other major governmental activity. Aviation has been growing, and growing rapidly. There has been every reason to expect its proportionate share of the attention of the American people would continue to increase. Yet the government's attention to aviation, as indicated by appropriations, has not merely stopped increasing and begun to decrease, but is decreasing much more rapidly than for other comparable activities.

Let us take an example. The Aeronautics Branch is charged with the construction and maintenance of airways, and with the regulation of American commercial flying and aircraft construction. Two years ago the total appropriation was $10,300,000 for the year. For the present fiscal year Congress appropriated $7,600,000, and now the Secretary of Commerce by administrative decision has determined that only 68 per cent of that amount, or $5,172,500, will be expended. Inevitably that means drastic reduction in airway service, in research, in mapping work. The officials of the Department of Commerce will give us everything that they can. They will stretch every dollar to the limit, but there is no known trick by which five million dollars can be made to do the work of eight or ten.

WE DO not for a moment suggest that aviation should be immune from sharing in the sacrifices that the interests of government economy and the plans for economic recovery demand in every quarter. We must take our share of the general punishment, and believe that we shall gain back all that we have lost and much more besides in commercial sales and commercial revenues as recovery progresses, but we do take exception to making sacrifices far beyond the general run. Let us, for example, compare the figures just given for the fate of the Aeronautics Branch with corresponding figures for the services that the Department of Commerce renders to the merchant marine.

Take the Bureau of Lighthouses. The all-time high for lighthouse construction and maintenance up to a year ago was $10,944,000, only 6 per cent above the highest figure for aviation. The final cut that has just been made by the Secretary of Commerce still allows

$8,672,000 for lighthouse work, or almost 70 per cent more than aeronautics is to receive. Furthermore, that sum is to be supplemented by a special allotment under the new public works administration of $5,354,000 for lighthouses, while aeronautics receives only the almost trivial sum of $443,000 from the same source. To the regulation of aircraft corresponds the steamboat inspection service. Before the depression the bureaus of navigation and of steamboat inspection were spending about $1,700,000 a year. For the present fiscal year they are being allowed $1,270,000, a cut of only 25 per cent from the high, while aeronautics is taking a cut of just 50 per cent. Such illustrations could be multiplied.

THAT is but one of several reasons for feeling alarm. There is another in the air mail service, where the appropriation for domestic air mail has been cut by Congress from approximately $20,000,000 in each of the last two years to $15,000,000 this year. We believe more firmly than at any time in the past that American air transport is making steady and rapid progress towards a self-supporting basis, and that it will attain self-support within a very few years, but we cannot exaggerate the bad effects of arbitrary cuts which will force reductions of service just as the air lines are really getting a proper grip upon the fancy of the traveling public. A 25 per cent cut is bad enough, but that is now written into the law. The ground that has been lost may be regained by deficiency appropriation at the next session of Congress, and in the meantime the loss will not be absolutely fatal if the reduced appropriation is wisely distributed and widely administered. Unfortunately, however, there are persistent reports that the director of the budget is dissatisfied with the saving that has been made, and that he entertains plans for another 25 per cent cut on top of the one already imposed. We are not judging the situation too harshly in estimating that anything of that sort would mean a very substantial postponement of the day when air transport will be able to stand on its own feet with no direct government backing of any kind. The American people have become used to this service and they have no intention of giving it up, but it must be eased through the transition zone from a subsidized to an indepedent condition. Too brusque a treatment will not do, even from the point of view of economy.

In the sphere of military aviation there are no such definite figures on the new year's allowance as have been furnished by the Department of Commerce, but such information as exists is far from encouraging. The abolition of the assistant secretaryships for aeronautics was a disconcerting warning of a decreased regard for aviation in military and naval planning. The more or less humorous statements reported from the offices in the War Department to the effect that "we may buy an airplane now and then,"* and the constant emphasis on the importance of ship construction in the Navy Department, have been additional warnings. No one knows definitely just how much of their appropriations for the current year the War and Navy Departments plan actually to spend on the purchase of aircraft, but it seems clear that they plan for less than the law allows them. From the public works funds comes $238,000,000 for surface vessels for the Navy, with only $9,500,000 to be allowed for naval aircraft. Aviation gets but 4 per cent of the amount that is to go to ship construction. The aircraft industry has been making heroic efforts to carry on in spite of declining military markets, and to make up for difficulties at home by an increased effort in the export field, but there, too, a serious blow has been suffered in the virtual demobilization of the aeronautics trade division of the Department of Commerce. Its chief and its assistant chief are both out of the service of the government, its special aeronautics trade commissioners in the field have been summarily called home, and the aircraft industry will have to reorganize its export plans to get along without the invaluable help that has hitherto been received from Washington.

Put it all together, and it makes for the moment a somewhat gloomy picture. If we do not believe that the gloom is going to continue, it is because we have full confidence in the fair-mindedness of the administration and its desire to serve the public interest. We are confident that the public interest demands the continued support of our rapidly progressing air transport, and a reasonable expenditure for the continued development of military aviation. We are confident that the American people will make their voices heard, and that administration policy will be subject to change, if we make it really clear what aviation is suffering.

*As we are on the point of going to press there comes from the Secretary of War the much more encouraging and penetrating observation: "The construction of airplanes, besides enabling the Army to complete its five-year program, would give work to a great many highly specialized workers in an industry that is vital and that has been having a hard time to keep going."

## Bigger and better!

PERHAPS the function of an editorial should be limited to interpretation, counsel, criticism, and caution. Perhaps space in these three pages should be considered as too precious for any other use, but we just can't stick to any such rule as that. Every now and then we are unable to restrain ourselves from a note of simple exultation, and an editorial has to be written which has no possible object except to point with pride.

Recently they started an exposition in Chicago. They started in duly scientific fashion, with the help of a beam of light that had left Arcturus 40 years ago and been on the way ever since. The light that was destined to throw the switch had already made a full

two-thirds of its journey before the first regular American air mail service was started. But on the day that it finally flickered into Chicago, over 200 human visitors also arrived in that city—by air.

Expositions do American aviation a great service. The first landplane passenger service in the United States was started by patriotic Philadelphians to carry visitors to the Sesquicentennial of 1926. In 1933 the Century of Progress is bringing to Chicago by air people who never before gave the slightest thought to the possibility of flying, and every week brings a new quota of sensational traffic records as a result. In the January issue of AVIATION the editor forecast a passenger mileage on American air routes of 175,000,000 for the present year, an increase of more than 20 per cent over 1932. After a slow start in the first four months, it looks as though that prophecy might be exceeded by a comfortable margin.

Many Americans who had never thought of flying at all have in the past been converted to air travel by European experience. There is something about the holiday mood of the tourist that makes him willing to try a new form of transportation which he might never have thought of using in connection with his business. For that purpose, the Chicago exposition is replacing Europe. Fortunately this special spur to patronage synchronizes with the appearance on many routes of new planes setting a new standard in luxury, speed, and flying qualities. The greatest tribute that can be paid to American air lines now is an expression of our confidence that they give so good, so efficient, and so comfortable a service that we can rely upon it that most of the travellers to and from the Fair who make use of the airplane even once on their trip can be recorded as converts who will fly at every opportunity in future. Air transport is taking, during the present summer, another long step around the corner that leads to solid establishment as a major part of the American transportation system.

## The Roman legions fly westward

OUTSTANDING characteristics of fascism under Mussolini have been daring and drama. That a proposal is bold is enough to commend it to the Italian chieftain, and in Italo Balbo the leader has a follower who fairly outruns him. The mass flight around the Mediterranean four years ago seemed a colossal undertaking. The flight to Brazil was even more spectacular. Both appear insignificant in the shadow that is cast by the voyage of 24 Savoia-Marchetti boats across the North Atlantic.

We have had plenty of chances to get used to the remarkable reliability of modern aircraft engines and flying equipment in the past few years. We have reached the point where we need never expect a failure, and where it is occasion for astonishment if one occurs. Neverthless it is still possible for even the most hardened observer of aeronautical development to draw a tingle up and down his spine from the performance of 24 twin-engined boats, heavily loaded and fully manned, which fly from Western Europe by way of arctic seas to Chicago without damage to a ship and without the faltering of a single unit in the line.

To General Balbo and General Pellegrini and the 100 men who make up the expedition, all possible expressions of admiration and praise are due. To the more nearly anonymous designers and builders of Savoia-Marchetti planes and of Isotta-Fraschini engines there goes the gratifying knowledge of the applause of their peers abroad—the men who know by first-hand experience the problems involved in developing equipment that will stand the test of such a flight. At the moment when these lines are written, the squadron is at rest in New York harbor. Wishing them all possible success in the eastward passage which they talk of making by more direct route and in longer hops, we can extend no higher compliment than to say that we believe that they will get away with it and that the Balbo air force will return safe and intact to its own shores.

IT IS not envy, but an honest desire to learn from the experience and the pioneering ventures of others, that makes us draw a lesson for American consumption from every performance as notable as this. In the present case we express again, as on various occasions in the past, our profound regret that American air forces have had in the last few years so little long-distance overseas squadron operation of a genuinely testing nature. The strategic problems of the United States lie largely in the Pacific. We renew the suggestion, already made in these pages, that the Navy Department should without further delay perfect its plans for a squadron flight by American flying boats around the Pacific from our Pacific Coast to Honolulu, through the islands of the South-western Pacific to Australia and the Philippines and perhaps a courtesy call in Japan, if the authorities there desire it, and then back by the island route to Hawaii. As a test of equipment and of personnel, and as a demonstration of the quality of our forces, such a flight would be well worth while. It would be so well worth while that it seems to us almost obvious that it should be made if it can be. A few months ago there might have been doubt on that score, but there can no longer be any question about the possibility of making a circum-Pacific flight within the next couple of years. To question it would be to admit the inferiority of our own equipment and our own organization to those of the Italian Regia Aeronautica. There is no occasion for any such admission, and we do not believe that the Navy Department wants to put itself in the position of making it.

# STATISTICS OF THE MONTH

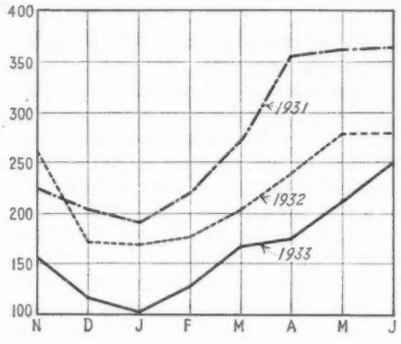
*Supplementing the statistical issue of* AVIATION, *March, 1933. Page numbers refer to that issue*

### PRODUCTION AND LICENSING
*(Page 77)*

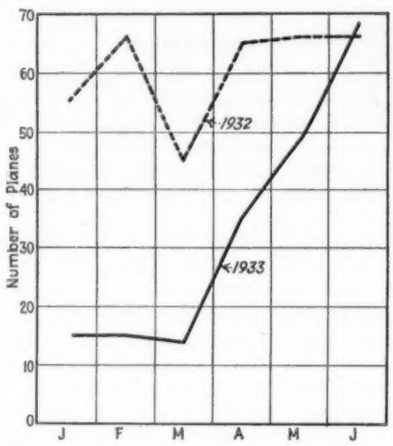
**Valid Licenses and Identifications**
*July 1, 1933*

| | |
|---|---|
| Licenses | 6,923 |
| Identifications | 2,211 |
| Pilot licenses | 18,045 |
| Student permits outstanding | 7,532 |

AIRPLANE PRODUCTION, as indicated by the reports of licenses and identifications issued for the first time, having started the year as an insignificant fraction of 1932 figures, by June had more than equalled the record of its predecessor. Completion of new transports for several of the major air lines has played a part. Reports from the factories indicate a steady and rapid rise in the production of private aircraft. July should go well over a hundred machines produced, and so should August. The curves on the accompanying chart are based on four and a third weeks to each month and include only the products of regular manufacturers, excluding the home builders and the makers of purely experimental aircraft.




**Average weekly issuance of student permits.**




**Planes licensed or identified for the first time, by months.**

### FOREIGN TRADE
*(Page 86)*

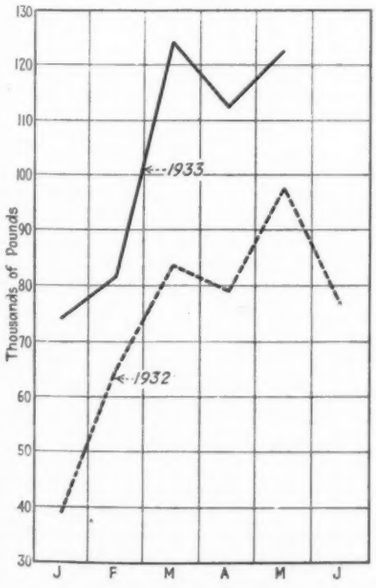
EXCEEDING all levels except the flood tides of 1929 prosperity, exports of airplanes, engines and accessories during the first five months of 1933 totalled $3,748,410. Sales of airplanes abroad were largely responsible for this increase of some 160 per cent over total aeronautical exports of the same period of the previous year. They amounted to $2,412,761, for 177 planes, more than four times the similar 1932 figures. Increases of 67 and 49 per cent, respectively, in exports of engines and accessories were relatively unimpressive. Engine sales reached $521,047, accessories $814,602.

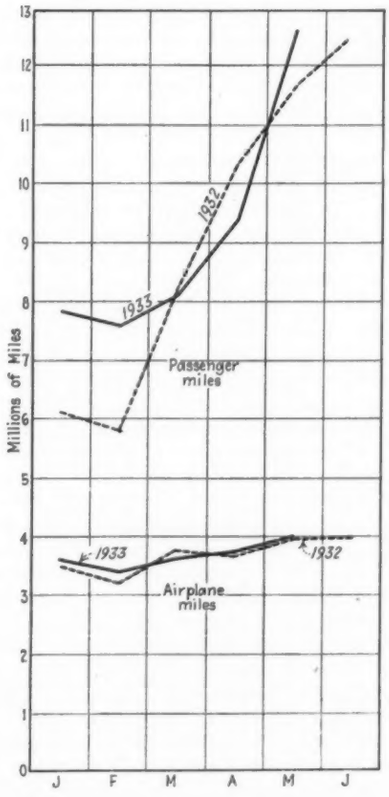
By far the best customer of American aeronautical manufacturers so far this year is Brazil, which accounted for more than a quarter of the total foreign sales, $1,025,000 worth. China, next in line, purchased barely half that amount. Like the two leaders, Colombia, a poor third, spent most of its funds on completed aircraft. Russia, Netherlands, and Germany, next on the list, ranked first, second, and third as buyers of American engines, which are seeing service in the transport fleets of Deruluft, K.L.M., and Deutsche Luft Hansa. Japan headed the list of accessory purchasers in the early months of this year, as it did last.

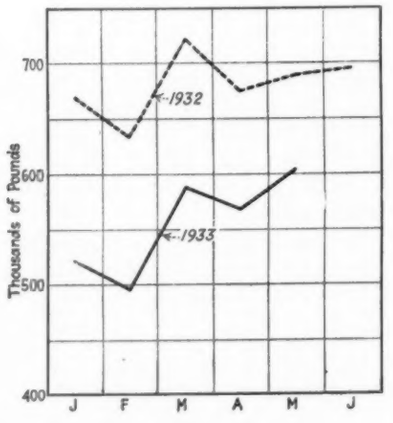
### AIR TRANSPORT
*(Page 60)*

**Scheduled Operations**
*First Five Months 1933*

| | |
|---|---|
| Miles flown | 18,568,208 |
| Passenger-miles | 45,551,107 |
| Express carried (lb.) | 515,609 |
| Mail carried, domestic (lb.) | 2,786,352 |




**Seasonal curves of scheduled air transport operations. Left: Air express. Center: Passenger traffic. Right: Air mail.**

# NEWS OF THE MONTH

### *Rome-Chicago express*

JUSTIFYING many months of careful preparation and rigid training the Italian air armada glided to moorings on Lake Michigan late on the afternoon of July 15 after a 6,100-mile flight from Orbetello. Air Minister General Italo Balbo had led the 24 flying boats practically in formation over Alps and Canadian wheat fields, as well as over the befogged water of the North Atlantic, in 47 hours, 52 minutes flying. Fifteen days had elapsed, however, since the take-off from the home base on the Tyrrhanian Sea, on the west coast of Italy. After the stop at Amsterdam, where the only accident of the trip occurred, the log included Londonderry, Ireland, and bad weather; Reykjavik, Iceland, more bad weather and a subsequent breathless calm which made it impossible to lift the heavily-loaded ships from the water; Cartwright, Labrador, end of the longest leg of the flight; Shediac Bay, N.B.; Montreal, and finally Chicago. Each of the flying boats, similar to the squadron of planes which General Balbo led across the south Atlantic in 1930, carried pilot, co-pilot, mechanic, and radio operator. Savoia-Marchetti S-55's powered with two 750-hp. Isotta Fraschini engines, each is equipped with two Sperry directional gyros and an artificial horizon. Communication with the Italian headquarters at Rome was maintained throughout the flight.

The field organization behind this largest and longest mass flight had to provide not only for servicing, repairing and refueling the planes, but for the needs of the 96 members of the expedition in regions where food supplies are only adequate to carry the population over until the arrival of Spring supply steamers. Stanavo Specification Board, which handled the fuel supply, also provided for the human element. Though provision has been made for a return trip by the same route, no definite decision has been made between it and the alternative southern route by way of Bermuda, the Azores, and Lisbon, Portugal.

### *"Magnifico"*

Three minutes before midnight of July 22 Wiley Post landed in the arms of waiting thousands at New York's Floyd Bennett Field to complete the first solo flight around the world at a new record time of seven days, eighteen hours, 50 minutes. Following the trail he and Harold Gatty had blazed two summers ago, the Wasp-powered Lockheed monoplane made its second circuit of the globe in almost exactly 21 hours less than in 1931. Its flying time was about four days, twenty hours. With automatic pilot, controllable pitch propeller, rejuvenated engine and an increased fuel supply of 640 gal. the Winnie Mae got off to a fine start in a record flight of 25 hours, 45 minutes from Floyd Bennett to Tempelhof in Berlin, where Post delivered the first pictures of the Italian Armada landing at Montreal. The fog and storm which haunted even the first leg of the 15,956-mile flight subsequently forced five landings not on the original itinerary, but failed to defeat a project which General Balbo characterized as magnificent.

### *For an ocean airline*

Retracing the path of the Italian air fleet through the sub-Arctic are Colonel and Mrs. Charles A. Lindbergh on a survey trip for Pan American Airways to investigate the feasibility of the Northern route to Europe. Selection of suitable terminal sites and of the type of plane best suited to local conditions will be their main concern. This is to supplement the scientific surveys covering magnetic, meteorological, radio and flying conditions over the northern route, which have been conducted for several years by British, German and Danish expeditions as well as by Pan American. The airline has had two parties in Greenland during the past year, one at Tuktilik, 80 miles north of Angmagsalik in East Greenland and the other far up on the other side of the island, some 100 miles north of Upernivik, West Greenland.

The veteran Lockheed monoplane with Edo floats which Colonel and Mrs. Lindbergh flew to China is carrying them over the northern waters of another ocean. A new 700-hp. Wright Cyclone engine equipped with a downdraft carburetor and a new instrument panel including the Sperry Gyroscope Company's artificial horizon and directional gyro considerably improve the performance and efficiency of the plane. After a stop at Cartwright, Labrador, which they reached on July 14, the Lindberghs plan to spend some time exploring the Greenland shoreline and fjords for landing places before flying on to Iceland and perhaps to Denmark. Representatives of Pan American Airways, Imperial Airways, and the civil aviation branch of the Canadian Department of National Defense, conferring at St. Johns with the Newfoundland Government, on July 16 reached an agreement on plans for the operation of the service being mapped out by Colonel Lindbergh. Ratification by the countries involved will be necessary before the service can begin, however.

### *More fast transports*

The new equipment recently acquired by several of the major air lines seems to be insufficient to handle the traffic increases which have resulted from the new fast schedules it made possible. American Airways which reports capacity loads on the new Condors flying its recently inaugurated Valley Route between New York and Chicago has purchased 23 new transports for August delivery. It is expected that eight planes of this $800,000 order will be new 220 m.p.h. single-engined Vultee transports designed by the Cord subsidiary, Airplane Development Company [AVIATION, April]. With 40 new Boeing transports already flying its routes throughout the country, United Air Lines has placed an order for fifteen more, bringing the total orders for this model up to 75 planes.

Other West Coast factories are working on new speed planes for Transcontinental & Western Air. Test flights of the Northrop Delta with which the company plans to fly a sixteen-hour coast-to-coast service are now being made in Los Angeles. A twenty-two passenger twin-engined transport under construction for this line at the Douglas plant, which has heretofore turned out military planes and amphibians almost exclusively, has just been test-flown.

Northwest Airways will make a bid for increased patronage with twin-engined Lockheed Electra transports [AVIATION, June], early in the fall. Wasp-powered, these planes are expected to carry ten passengers and two pilots from the Twin Cities to Chicago on two-hour schedules and to Seattle in ten hours flying time. Three 12-passenger tri-motored transports have also been purchased by Pennsylvania Airlines to go into service immediately on the company's Washington-Cleveland run. Traffic on that line during June exceeded by some 20 per cent the previous high point.

### *New schedules*

With new additions to its fleet of Curtiss Condors Eastern Air Transport has improved its service on several routes. The New York-Washington schedule is being flown exclusively with the Condor transports. Five are non-

stop flights, cutting the flying time between the cities from two hours ten minutes to one hour and 35 minutes. A passenger and express service of three round trips daily has been started between Philadelphia and Atlantic City, and the schedule between New York and the resort city increased from one to three trips daily each way. The fare is $11 round trip. In addition, a daily through service to Washington, with stops at Philadelphia and Baltimore, leaves Atlantic City at 6:50 a.m. to return at 8 p.m. The trip takes two hours.

Escorted by Commander Frank Hawks, after whose record-making Sky Chief the service was named, the first plane of T.&W.A.'s new through transcontinental schedule left Newark on July 1. It eliminates the over-night stop at Kansas City and increases the night flying of the line to about half its total flying time.

### *New West Coast service*

An air transport link with transcontinental air services was made available to coast cities of California along the Mission Trail when Pacific Seaboard Air Lines recently inaugurated its Los Angeles-San Francisco service on the coastal route. Red-winged Bellanca Pacemakers fly the route twice daily in each direction on three-and-a-half-hour schedules, stopping at Santa Barbara, St. Luis Obispo, and five other cities of euphonious name and Spanish ancestry. The United and Varney services between Los Angeles and San Francisco are flown non-stop, and further inland. Sportsman-pilot Carleton Putnam of New York is heading the new venture.

### *Sleepers in the air*

Having just completed seven years of flying operations between New York and Boston, its original route, American Airways is making several innovations in its services. Sleeping berths, previously the monopoly of Pullman cars, are available on the night planes of its southern transcontinental line. Each of the tri-motored planes used accommodates six sleeping passengers. American Airways is adopting the practice, more familiar abroad than in this country, of issuing scrip books at reduced rates to frequent users of air transportation. Transferable among employees of a company or members of a family, the books provide $250 worth of travel for $212.50.

Some of the sales and service operations of Thompson Aeronautical Corporation taken over by American Airways last year are being reinstated. Twenty-four hour service is available at the old Thompson hangar at Cleveland Municipal Airport, as well as at Chicago, where the company has opened one of its hangars for service and storage for private airplane owners visiting the exposition. Also, surplus airplanes are being offered for re-sale at Chicago and Cleveland. This is the first reentry into private plane service by the company since its Universal schools were disposed of some years ago.

### *Fuel for the airlines*

Socony-Vacuum Corporation during the next year will supply two million gallons of its Aviation Mobilgas to American Airways for use exclusively on its Eastern lines. United Air Lines also have a contract with Socony-Vacuum. Rocker arm lubrication in its new Boeing transports is to be furnished by that company's Aviation Mobilgrease. Gasoline requirements of U. S. Airways, operating passenger, mail and express services in Kansas, will be supplied by the Texas Company, which has also renewed its contract to handle the gasoline, oil and grease requirements of Curtiss-Wright Flying Service bases at North Beach, and Valley Stream, N. Y., Caldwell, N. J., and at the Chicago Air Terminal and at Milwaukee. Texaco will also supply two grades of aviation gasoline to the Wright Aeronautical Corporation.

Organizations requiring qualified pilots to handle such positions as operations manager, field manager and others calling for executive as well as flying ability are invited to communicate with the Air Line Pilots Association. They have on file the names of a number of pilots experienced in all types of flying.

With everything from pretzels to busts of President Roosevelt traveling by air express in increasing volume, unit costs, especially between large cities, have dropped. Reductions ranging up to 20 per cent have been made in rates on general air express as a result. Most benefited are shippers on most-travelled routes, since the rate of reduction is based on the volume of express carried, but somewhat lower tariffs are passed on even to cities served by air-rail connections.

### *Speed on European lines*

No less than six world's speed records over a measured course with specified useful loads have been taken by the new Heinkel transport HE-70, which is going into service on Deutsche Luft Hansa routes this summer and possibly on projected long-distance runs from Berlin to Salonika, Barcelona, and Friedrichshafen. One hundred, 500, and 1,000 km. courses were flown with 1,100 lb. loads and the 500 and 1,000 km. with no load, all at a fraction over or under 216 m.p.h. An average of 215 m.p.h. was made on 2,000 km. (1,250 miles) without load. More recently this transport made a straightaway speed of 235 m.p.h. in official tests by the German government aeronautical laboratories. Product of the Ernst Heinkel Flugzeugwerke in Warnemuende, it is powered with a 640 hp. glycol (Prestone)-cooled B.M.W. VI engine. [For description see AVIATION, April.]

Though the Hamburg-American line does not provide catapult service for passengers as well as mail, it provides the next best thing, airplane service from Cuxhaven, the point of debarkation, to certain German cities. If at least three passengers are booked, planes are provided at rates varying from about $5 to $40, the fare to Munich.

Daily schedules between Berlin and Rome are being provided by the cooperation of Deutsche Luft Hansa with the Italian line Societa Aerea Mediterranea. Each company flies one plane which leaves at 7 a.m. to arrive at the opposite terminus at 4 p.m., after stops at Venice and Munich.

An order for three F. VIIb-3m transports has just been placed with the Fokker Company at Amsterdam by the Spanish Lineas Aerias Postales Espanolas. Each is to be powered with three Armstrong-Siddeley Double Mongoose 340-hp. engines, twelve of which have been ordered from the Coventry factory. The new equipment is for a new line to be opened between Sevilla and the Canary Islands via Cape Juby. Though financed by the Spanish Government, LAPE is run as a commercial enterprise operating daily services between Madrid and Barcelona, and Madrid and Sevilla.

### *Foreign sales*

Checking up on export business for the first half of this year, the Curtiss-Wright Corporation reports orders amounting to $2,500,000 since Jan. 1, more than the total of 1932 exports. Among the 101 planes sold abroad 54 were Curtiss Hawks. Two orders for eighteen of these single-seater fighting planes, powered with 700-hp. Cyclone engines, were received from the Chinese Government, one after the summary had been made. The 36 planes cost about $1,000,000.

The Curtiss Aeroplane & Motor Company's Buffalo plant is also working on an order for 28 Hawk fighters for the Navy. Latest model of a type which the Navy has been using for some ten years, these Hawks, designated

## Calendar

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| September | International Gliding Congress and Meeting, La Banne, d'Ordanche (Clermont Ferrand), France. |
| Sept. 1-4 | International Gordon - Bennett Balloon Race and Air Races, Chicago. |
| Oct. 7-8 | U. S. Amateur Air Pilots Association Charity Air Pageant, Roosevelt Field, Long Island, N. Y. |
| December | International Rally, Cairo, Egypt. |
| December 14 | Meeting of the Federation Aeronautique Internationale, Cairo, Egypt. |

FIIC-2 are destined for the High Hat Squadron at the Naval Operation Base, North Island, San Diego, Calif. The contract amounts to $500,000.

### *Aeronautical public works*

As the Federal Emergency Administration of Public Works got under way on July 14 with allocations of $115,513,610 from the fund for projects throughout the country, aviation was almost neglected. Allotments to all branches of the industry amounted to $739,000. The Bureau of Aeronautics of the Department of Commerce got $443,000 for relocating and improving beacons and radio facilities along the airways (on which other beacons must be turned off to keep within the bounds set by budget pruners), the Alaska Road Commission was allowed $96,000 for air fields, and the National Advisory Committee for Aeronautics $200,000 for experimental work and equipment at Langley Field. In the allocation of Department of Commerce funds the Aeronautics Branch also has come out on the short end. It will be allowed $5,172,500, barely two-thirds the amount appropriated for it by Congress.

Though the development of aircraft as auxiliary fleet weapons to the fullest extent is included in the "second to none" naval program of Secretary Swanson, and the construction of airplanes to bring the Army Air Corps equipment up to the standards of the five-year program of 1926 is urged by Secretary of War Dern as part of the public works program, as yet no contracts have been forthcoming.

### *Aviation's code for the NIRA*

Adopting the reorganization plan previously outlined by its President Thomas A. Morgan [AVIATION, July], the Aeronautical Chamber of Commerce at the meeting of its board of governors on June 30 got under way as the trade association representing the aviation industry under the provisions of the Industrial Recovery Act. The meeting elected Leighton Rogers executive vice-president in charge of all activities of the chamber and authorized the appointment of two committees, one to assemble the industry's views in a code, and the other to reorganize the chamber for its work as instrument of the industry. It was later decided that the board of governors would itself act as the code committee. All elements of the industry, manufacturers, transport operators, commercial operators, airports and accessory and fuel sections are being reached by questionnaire and personal contact before the formulation of the code, to be drafted late in July. At the meeting Consolidated Aircraft Company and the Douglas Company announced their intention of becoming members, making the Chamber's representation of the aviation industry almost complete. Major R. H. Fleet of the Consolidated company was elected a governor.

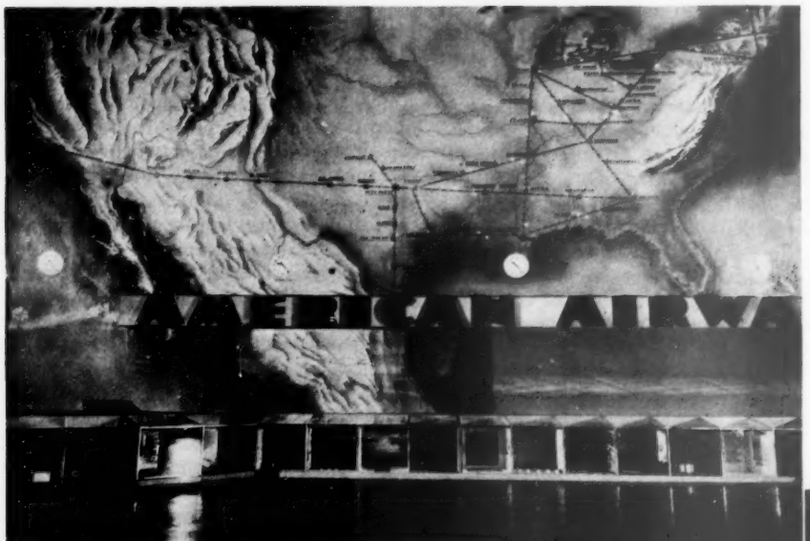
### *Bulletin No. 7-A reduces*

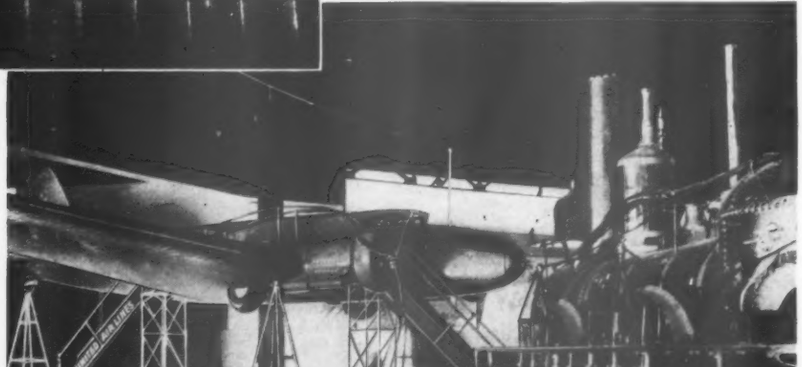
To keep pace with advances in aerodynamic information and eliminate many of the arbitrary and detailed design requirements now contained in it, the Department of Commerce is planning to make extensive changes in the Airworthiness Requirements of Air Commerce Regulations for Aircraft, Aeronautics Bulletin No. 7-A. A conference with aircraft manufacturers, originally called for July 27, has been postponed for about a month to allow time for perfecting the proposed changes. The revised bulletin will probably contain only the essential major specifications. Other specifications, design data, and recommendations are to be published separately under some such title as Recommended Practices and General Design Information.

Maps showing wind direction and velocity in the upper air at various levels up to 13,000 ft. and in some cases higher, available twice daily at important terminals in the Federal Airways System, are another service to pilots recently added by the Aeronautics Branch.

### *Another gas tax case*

Another addition to the body of legal precedent permitting the taxation of gasoline used by airlines was made recently in the federal courts of Louisiana.





**TWENTIETH CENTURY TRANSPORTATION**

**Dominating feature of the American Airways exhibit at the Century of Progress Exposition is a vast map on which the position of each plane in flight on the line is shown. Right: United Air Lines contrasts its Boeing transport with an 150 mile an hour slower veteran of early English railroad operation.**

The claim of American Airways to exemption from payment of the special 5-cent state tax was denied by a three-judge court composed of U. S. Circuit Judge Rufus E. Foster, and Federal Judges Wayne G. Borah and Ben C. Dawkins. Though the gasoline had been purchased outside the state and merely stored at Shreveport, its use to refuel the company's planes at landing fields in Louisiana was considered taxable, and not in restraint of interstate commerce. A similar decision was handed down by a Wyoming Federal District Court a few months ago [AVIATION, June] when Boeing Air Transport claimed exemption on the grounds that a similar tax was unconstitutional in that it placed a burden on interstate commerce.

The U. S. Circuit Court of Appeals has sustained the decision of a lower court [AVIATION, April, 1932] denying the claim of Robert Esnault-Pelterie against the Chance Vought Corporation for infringement of his stick control patents, in and out of American courts since 1924. A Court of Claims case involving military planes used during the war, is still pending.

### *Air race victors*

Following a tradition of several years standing, the Bendix Trophy Race which opened the 1933 National Air Races set a new record. Col. Roscoe Turner made the 2,500 miles from Floyd Bennett Field to Municipal Airport, Los Angeles, in eleven hours 30 minutes, some 53 minutes better than the westbound record set by him last November. The record for the flight in the opposite direction, made by James Wedell in last year's Bendix event, is an hour and eleven minutes faster. James Wedell, designer of the Wasp-powered Wedell-Williams racer which Colonel Turner flew to victory, followed hard on his heels to second place in an elapsed time of eleven hours 58 minutes. The other four contestants failed to finish in the allotted time.

Wedell also gave Turner his major competition in the Thompson Trophy Race, speed classic of the race meeting, and carried away the first prize when Turner was disqualified for failing to round a pylon on the first lap of the 100-mile event. He made 241.05 m.p.h. even after circling the pylon a second time on the second lap in an effort to rectify his error, but was eliminated by decision of the contest committee. Flying another plane of his own design, identical with Turner's except that it carried only a Wasp Jr., Wedell averaged 237 m.p.h. Yet a third Wedell-Williams racer, built for last year's races, Wasp Jr.-powered and flown by Lee Gehlbach, took second place. Roy Minor flew the Howard Special, with Menasco B-6, in a particularly fine race to third place, followed by George Hague in a Menasco-powered Keith Ryder and Z. D. Granville in one of his stock model sportsters. The Gee Bee Racers, one of which holds the world's landplane speed record, which were expected to offer real competition to the Wedell-Williams entries were both damaged in landings en route to the coast in the Bendix race. All six entrants in the Thompson event will appear before the N.A.A. contest committee on Aug. 9 in hearings on the race decision, appealed by Colonel Turner.

In the 550 cu.in. class Benny Howard's Menasco-engined plane was flown to first place in four out of five events by Roy Minor, but always close pressed by Ray Moore in his Keith-Ryder racer with Menasco engine. Lee Miles took most of the victories in the 375 cu.in. group, flying the Menasco-powered Miles & Atwood Special, with George Hague in the smaller Keith-Ryder usually only a few yards behind. The race meeting showed a profit this year, some $5,000, for the first time since 1930 when a ten-day session was held at Chicago.

At the American Air Races in Chicago, John Livingston and Art Davis, both flying Warner-powered Cessna planes especially built for the races, carried off most of the laurels. Livingston's plane was clocked at 237 m.p.h. on a straightaway course.

### *British air events*

Victory in the King's Cup Race held at Hatfield Aerodrome near London on July 8 went by a scant 30 ft. to Captain Geoffrey de Haviland, a competitor in the annual classic since 1908. The Gipsy Major-powered Leopard Moth of his own design finished the fourth circuit of an 800-mile race just ahead of the Comper Swift with Pobjoy, flown by Flight Lieut. E. C. T. Edwards. The 1933 event, flown in four 200-mile circuits each practically an elimination contest for the final round which included only eight of the 38 planes entered, was a decided change from previous practice. King's Cup races in the past were flown in a lengthy course over most of England.

Steady rain and poor visibility brought extra hazard and excitement to the Fourteenth Annual Royal Air Force Display at Hendon on June 24. However, the beautiful precision of the formation flying, aerobatics, and other demonstrations which are always the feature of the day were not altered by the first bad weather since the 1922 display. Outstanding among the fifteen new and experimental planes in the flypast were Cierva's latest autogiro, C-30, on which the only fixed surfaces are a fin and tail-plane for stability; the Super Fury, Hawker fighter with Rolls-Royce special Kestrel engine; and two ventures in fuel oil burners, the Westland Wapiti with 350-hp. Bristol Phoenix, and Hawker Horsley powered with the Rolls-Royce Condor IIIB which develops 480-hp. in its modified heavy-oil form.

**DEPUTY**

**Malcolm Muir, president of McGraw-Hill Publishing Company, publisher of AVIATION, has been made Deputy Administrator of the National Industrial Recovery Act.**

To distinguish aircraft built in Great Britain and certified as airworthy under the Air Navigation Order of 1923, a British Aircraft Mark has been established. Application of the mark, which consists of a lion rampant in gold within three circles of red, white, and blue, with the words British Certificate of Airworthiness in the white ring, is authorized by the Secretary of State for Air.

### *General Aviation grows*

Latest chapter in the history of the North American Aviation-General Aviation Manufacturing family is the consolidation of the B/J Aircraft Corporation, a North American subsidiary since 1930. Its manufacturing activities, concentrated on military planes, will be combined with those of General Aviation which is at present occupied with the production of high-speed transports for Japan and Switzerland as well as for Pan American Airways. Builder of the YP-16, first two-seater fighter to be used by the Army Air Corps, the B/J people are now working on both single and two-seater fighters for the Navy as well as two-seater observation

planes. Temple N. Joyce, co-organizer of Berliner-Joyce Aircraft, B/J predecessor, will become executive vice-president and general manager of General Aviation. F. S. Hubbard, also of the B/J company, is to be his assistant. J. M. Schoonmaker, Jr., continues as president.

### *Consolidated goes west*

Construction has been started at Lindbergh Field, San Diego, on a new plant for Consolidated Aircraft Corporation. Its Commodore flying boats, Fleetster transports, lighter Fleet biplanes, and various military types are now made in Buffalo.

Increasing use of the Department of Commerce radio beams and other flying aids is responsible for the jump in the sale of aircraft radio receiving sets by Westport Manufacturing Company of Glendale, Cal. ,to more than 25 a month. Originally used exclusively in transports, about half the installations are now being made in privately owned planes.

### *Personnel*

Phillip G. Johnson, president of United Air Lines, was recently elected president of United Aircraft & Transport Corporation, to direct the manufacturing as well as the operating activities of the parent company. He succeeds Frederick B. Rentschler who becomes vice-chairman of the board, a new office just created by the directors.

Recent orders have brought back from sea duty to service at the Bureau of Aeronautics Comdr. Robert R. Paunack, Lt. Comdr. Donald B. Duncan, Lt. Comdr. John J. Ballentine, and Lt. Comdr. James B. Sykes.

Capt. John H. Towers, who was chief of staff and commander of aircraft of the Battle Force, has been ordered to the Naval War College at Newport, R. I., as instructor.

Lt. Comdr. Charles P. Mason of the U.S.S. Langley has been made executive officer of the Naval Air Station at Norfolk, Va.

Major Jack Berry has returned to Cleveland as manager of the Cleveland Airport. Major Berry held this position from 1926 until early this year, when he tendered his resignation.

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RUSSELL BOARDMAN who with John Polando in 1931 flew non-stop from New York to Istanbul to set a distance record which stood until a few months ago, died on July 3 of injuries received two days previously when his plane crashed at Indianapolis Municipal Airport in the take-off on a lap in the Bendix Trophy Race.

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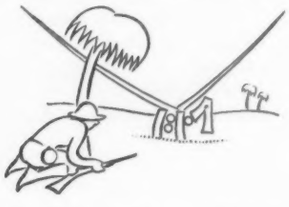
# SIDE SLIPS

*By Robert R. Osborn*

MR. S.P.J. of New York writes in that he is now getting up an expedition, probably to the South Seas, in search of some lower aspect ratios for airplanes. Apparently his ideas along this line came from the clipping which he enclosed,—being the technical description in another aeronautical magazine of an unusual airplane recently developed. We quote from the clipping "An aspect ratio, the lowest ever *discovered* in aviation, is one to one point



seven (1:1.7). Such an achievement is hailed by engineers as a major development in airplane design."

This reminds us of a similar happening which we reported in this column a few years ago. An aeronautical engineer, temporarily out of a job, worked up a new military design, and convinced a manufacturer of paper boxes that he should become a manufacturer of airplanes. The manufacturer accordingly set out to sell the new design to Navy officials at Washington. In the course of his sales harangue,—extolling the virtues of his design, he was going over the characteristic sheet and finally came to the dihedral for the wings. "Look at that!" he said," Dihedral 1½ degrees. That's going to be the best damn dihedral ever put into an airplane."

We note that among the new airplane instrument devices developed for the automatic flying of airplanes, is an altimeter which squirts a stream of cold water in the pilots face in case he has fallen asleep and the airplane has dropped to a too low altitude. At the height of the aviation boom, when student instructors were working fourteen hours a day, Roger Williams claimed that he could get in plenty of sleep in the course of his flying. He didn't need any automatic instruments to wake him up, as, he claimed, he always woke up during the first bounce, when his students made a bad landing.

A news item from the Los Angeles *Times* tells about the development of a new type of airplane propelling device, called a "gyradoscope." One of the associates of the inventor is quoted as predicting: "The gyradoscope should revolutionize aeronautics and herald a new era in world wide transportation. As the present airplane has made it possible to breakfast in Los Angeles and dine in New York, gyroplanes should make it possible to dine in Paris."

As all inventors make statements of this kind all progress in aeronautics may be due to the overwhelming desire of inventors to dine as far away from home as possible.

Instead of the usual two, The Intrepid Aviator picked up a handful of our cigars as he passed through our office on his weekly visit, saying that he needed them for scientific research. The clipping which he left on the desk in explanation stated that "out of six lighted cigarettes dropped from an airplane at 1,000-ft. altitude in a test in Europe recently, three were found on the ground afterward still burning."

In a recent magazine interview an airplane flying hostess said that, from her observations, men flew merely to get from one place to another as quickly as possible, and spent very little time looking out of the windows. On the contrary, women seemed to fly for the pure love of flying and were continually delighted with the scenery below.

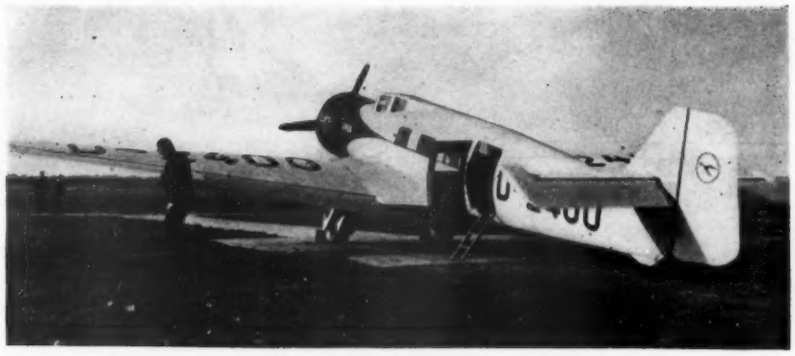
We have not met this particular flying hostess, but if she will send us her

photograph, we may be able to reach other conclusions why the men spent little time looking out of the windows.

In her analysis of types of passengers, we were surprised that the flying hostess referred to above did not mention the very nervous type of passenger,—the one who grips the arms of his chair as the plane is pulled off the ground, who bites his finger-nails and looks all around very worriedly when the ship is passing through patches of fog, and who nearly jumps out of his seat when the plane is stalled down for a landing. That very uncomfortable person is the pilot who has to make a trip along the line with another pilot at the controls.

# FLYING EQUIPMENT

## Two Junkers transport planes



Junkers Ju 60 high-speed transport for Luft Hansa.

SUCCESSFUL operation of the four-engined Junkers G-38 by the German Luft Hansa throughout the summer of 1931, on the Berlin-London route, has encouraged the construction of a second machine of the same general type embodying certain changes in passenger carrying accommodations. By a deepening of the fuselage just aft of the wing, additional cabin room has been made available so that the new machine will seat 34 passengers instead of 25. In order to get the necessary window space, the forward section of the cabin has been raised above the after section so that the machine represents a definite step toward the long prophesied two-deck transport airplane. The space made available under the forward cabin is used for storage or freight.

The other major change has been in the replacement of the two outboard engines with ones of greater power, stepping the total up from 2,200 hp. to 2,600 hp. In spite of the increased weight of the new power plants and the additional weight in the fuselage changes, an increase in payload of approximately 20 per cent has been obtained. It would be expected that the increase in gross weight (amounting to about 13 per cent) would raise the landing speed, but by making certain changes in the adjustable wing flaps, a decrease in landing speed of somewhat over 10 per cent is reported.

All Junkers aircraft, from the two-place 80-hp. Junior to the huge airliners of the G-38 class, have had at least one outstanding design feature in common. From stem to stern and from wing tip to wing tip, the skin surfaces have invariably been of corrugated sheet metal. Thus the Ju 60, a high-speed, single-engine transport, with smooth skin fuselage and wing stubs, represents a real departure for Junkers designers.

The first of the Ju 60 models has already gone into service on Luft Hansa, and a second is under way for delivery by the end of the year. The ship has been developed to replace the older F-13 or W-33/34 models. Powered with a BMW Hornet 525-hp. radial air-cooled engine, it shows a top speed of approximately 174 m.p.h. In common with other Junkers commercial models, the auxiliary wing or trailing edge flap is fitted, which cuts the landing speed down to about 59 m.p.h.

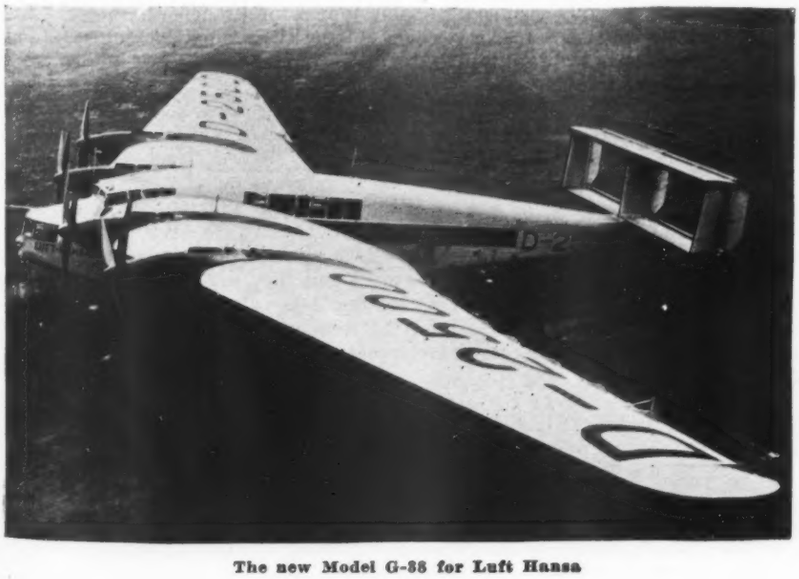
The framework of the fuselage consists of four longitudinal spar tubes carrying the cross-frames and bulkheads. All structural members are of the open type to facilitate inspection. Except for the changes necessitated by the adoption of the smooth metal outside covering, the general practice follows established Junkers methods. Both the engine section and the wing panels are attached to the fuselage structure proper through Junkers-type ball joints. The tapered wings are built around two main spars.

The undercarriage retracts into the lower part of the wing by swinging upward and forward, the reversal of ordinary American practice, as typified by the Boeing 247. About half of the wheel diameter projects below the housing when in the retracted position, but special nose pieces and fairings behind each wheel make for a reasonably good streamline shape.

The Ju 60 accommodates six passengers and two pilots. Four of the passengers face forward and two on a bench across the forward bulkhead face aft. The details of the cabin fittings have been carefully worked out, but due to the narrow fuselage the space allotted per passenger seems far below American standards of comfort and convenience. There is no aisle room whatever and to reach the forward seat, the customers must fold down or crawl over the rear seats.

General characteristics as furnished by the manufacturer are:

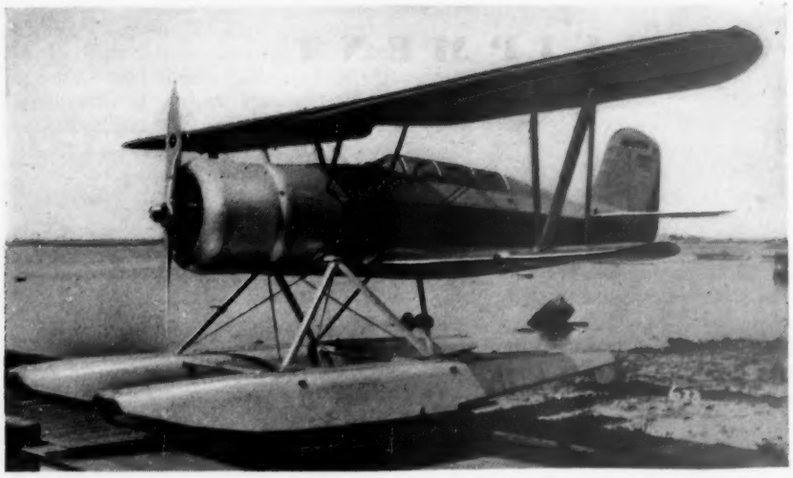
Length overall, 39 ft.; span, 47 ft.; height, 11 ft. 6 in.; payload, 1,105 lb.; weight loaded, 6,850 lb.; range, approximately, 620 miles.



The new Model G-38 for Luft Hansa

## Stearman 81 on floats

ON PAGE 194, AVIATION, June, 1933, appeared a complete description of the new Model 80 biplane pro-



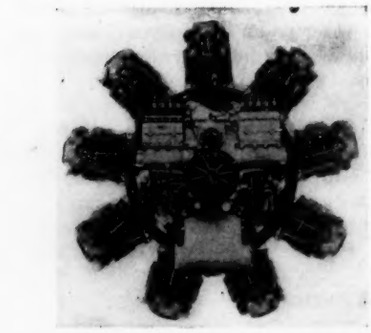
**Stearman 81 on Edo floats.**

duced by Stearman Aircraft of Wichita for general business and sport use. A slightly modified ship, the Model 81, has recently been tested and approved as a seaplane on Edo twin floats. The float installation was made with very little alteration to the basic structure, the cantilever struts which furnishes points of attachment for the oleo legs of the land gear were used for attachment of the main float struts, and a pair of extra fittings on the lower longerons provided for the rear struts. Standard Edo water rudders were used. As in the Model 80, a Pratt and Whitney T3A Wasp Junior of 420 hp. was installed. A Hamilton Standard controllable pitch propeller of the latest design was also fitted.

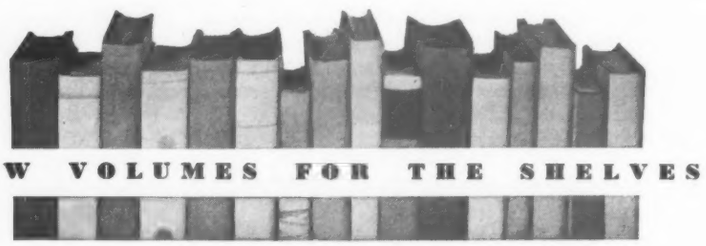
## British engine with compression ignition

THE Royal Air Force display at Hendon on June 24 was the scene of the first public appearance of Bristol's air-cooled compression ignition engine. It was fitted in a Westland Wapiti general purpose ship. The engine has been under active development for the last eighteen months and is the outcome of some seven years of research work by the Bristol Aircraft Company. It has been run about 200 hours on the block. No attempt has been made to boost the power output by using high explosion pressures and no special fuel mixtures have been specified. A gasoline of approximately 0.85 specific gravity used regularly by the Admiralty for motor trucks gives easy starting and smooth running. It is stated also that the engine's operation at idling speed is very satisfactory.

The Bristol Phoenix is a nine-cylinder radial engine of about 1,760 cu.in. displacement working on the four-stroke cycle. Its maximum output is some 400 b.hp. and the cruising power available at normal r.p.m. (1,900) is 350 hp. The net dry weight is 990 lb. and the overall diameter 53 in. Comparing the engine with the Bristol Pegasus, the power plant used to set the present world altitude record and to conquer Mount Everest, the overall diameter is about 2 in. less, the weight approximately the same, the power about one-third less and the cruising fuel consumption some 25 per cent lower.



**Rear view of the Bristol Phoenix, a new British compression ignition engine. Note the mounting of the fuel pump and the use of an Eclipse starter.**




AIRCRAFT AND THE LAW, *by Harold L. Brown; Robert O. Ballow; New York; 1933; 359 pages; $3.* The past twenty years have brought forth a great many books on air law for lawyers. This is the first competent work on air law for aviators and for the miscellaneous interested public without legal experience. Not at all "popular" in the sense of being slipshod or superficial, it has nevertheless been carefully planned to be easily readable and to introduce a minimum of legal technicalities and of legal latin. References to decisions and to legal periodicals are referred to footnotes, which the lay reader can blissfully ignore. The author, a member of the California bar, has covered a remarkable amount of ground in a very limited space, and has covered it with what appears to be remarkable success. The history of air law, its international aspects, the responsibility of air carriers, the relation between Federal and State control, such minor matters as the legal status of a wedding staged in an aircraft, the responsibility of the supplier of an aircraft part which proves to be defective, the enumeration of the types of insurance with which aviation has to deal and of their legal peculiarities, and the law of eminent domain in its application to the seizure of property to develop municipal airports are all treated in considerable detail. To the owners of aircraft and the officials or would-be officials of airlines and airports, the volume can be unreservedly recommended for reading. Lawyers will form their own opinions of its merits, but at least the reviewer can recommend very strongly that they should not fail to examine it. Among other virtues the book possesses admirable indices of its general subject matter, of the cases cited in footnotes, and of the references to other authorities.

THE BOOK OF THE SKY, *by Matthew Luckiesh; E. P. Dutton & Company; New York, 1933; 335 pages; $3.* Aviation from the point of view of a student of meteorology and of light and color. Several chapters are devoted specifically to such questions as stunting and air travel, but they are much less interesting and less valuable than the sections that treat of clouds and winds and of sunset colors and why they exist. For pilots the book possesses no particular value, even on the meteorological side for it is not sufficiently detailed and specific for their purposes. For the traveler by transport lines who wants to know something about the medium in which he travels, on the other hand, it will make interesting and reasonably easy reading.

# TRANSPORT

## *Operations and Traffic Management*

### Keeping industry's wheels moving

MODERN communication and transportation systems now turn industrial calamities into mere incidents. Not long ago a cracked cylinder head on a six-cylinder diesel engine operating important machinery in the midtown district of New York City threatened a serious tie-up. At 2:30 p.m. a quick-thinking executive put through a phone call to the engine manufacturer at Cleveland, describing the difficulties and placing an emergency order for a replacement part. In spite of the fact that about one hour's machining was necessary before the 265-lb. cylinder head could leave the plant, the finished casting was turned over to the Railway Express Agency and rushed across town by truck in time to catch a 4 p.m. plane for New York. The size and weight of the piece offered considerable difficulty in stowing away in the airplane's baggage compartment, but the ship got off on schedule, arriving at Newark Airport on time, where the shipment was turned over to a waiting truck. Actual delivery was made to the destination in New York at 8:20 p.m., just under six hours from the time when the order was telephoned to Cleveland.

### Teaching the young idea . . .

REALIZING that the children of today are the potential air travelers of the future, Luft Hansa, Germany's premier airline, has converted one of its Focke-Wulf transports into a children's airplane. The regular seats have been removed, and rows of smaller chairs installed to accommodate the youthful passengers. Frequent flight schedules from Tempelhof and other fields near larger cities make it possible for the rising generation to experience the comfort and novelty of air travel under ideal conditions.

**Youthful German citizens get their first aerial impressions from Luft Hansa's "Kinderflugzeug."**

**T. Russ Hill holds sales meeting at United Airport, Los Angeles, shortly after arrival from Salt Lake City on Western Air Express plane.**

### It seems there was an air traveling salesman

PERSONAL contact with a small army of salesmen scattered over the entire western half of the United States in the shortest possible time and without exceeding 1933 travel budget limitations was the problem before T. Russ Hill, vice-president of Airway Electric Appliance Corporation of Toledo, Ohio, recently. Speed naturally suggested the airplane, and with a little careful planning Vice-President Hill, making use of regular United Air Lines and Western Air Express schedules, was able to contact nine of his district offices in seven days at a total cost of less than half that which would have been required by using surface transportation.

The most novel feature of the expedition was the calling of sales meetings at the airports on which he arrived by plane. This was appropriate not only from the method-of-travel angle, but also because his company handles equipment and material for airport and airway use. It is obvious that a great deal of time was saved which might otherwise have been lost in traveling to downtown offices. Schedules were arranged so that all sales personnel involved met at the field at the time of the arrival of the plane by which Mr. Hill was traveling. Meetings were held where weather permitted, in the open air beside the waiting airplane, in some cases the talk and demonstration were actually made from the loading platform alongside the ship. In bad weather, by prior arrangements, the meetings were held inside airport administration buildings.

**By air**

| | |
|---|---|
| Fare | $293 |
| Hotel ($5.00 per night) | 15 |
| Meals ($1.50 per meal) | 15 |
| Incidentals ($3.00 per day) | 21 |
| Total | $344 |

**By surface transportation**

| | |
|---|---|
| Fare | $350 |
| Hotel ($5.00 per night) | 50 |
| Meals ($1.50 per meal) | 90 |
| Incidentals ($3.00 per day) | 60 |
| Loss of time* | 260 |
| Total | $810 |
| Actual Cost | 344 |
| Saving | $466 |

*Minimum salary rate of $20 per day.

# THE BUYERS' LOG BOOK

## AVIATION'S *Card Index of New Equipment*

***This department is equipped to help readers locate manufacturers of any parts, accessories or materials.***

**ACCESSORIES** — **Bearings, ball**

*The Fafnir Bearing Company,*
*New Britain, Conn.*

THE K series of double seal aircraft ball bearings built to A-N standards has been extended to cover the range from $\frac{3}{16}$ to $\frac{1}{2}$ in. bore. To meet a demand for similar bearings with smaller outside dimensions the KC Aeroseal series is introduced in $\frac{3}{16}$, $\frac{1}{4}$, $\frac{3}{8}$ and $\frac{1}{2}$ in. bores. Both series have metal seals, extended inner rings, are prelubricated and cadmium plated. (Aircraft Catalog).

AVIATION, *August, 1933*

**ACCESSORIES** — **Nuts, self positioning**

*Industrial Engineering Company,*
*239 John Street, Bridgeport, Conn.*

SNAP-NUT, a patented device to permit the use of machine screws or bolts in locations where ordinary nuts cannot be reached and held for driving. Automatically holds nut in proper position with respect to hole, and prevents its turning. Made for use with round, flat or mushroom head screws in steel or dural. Useful for attachment of skin, upholstery, trim, fairing, etc.

AVIATION, *August, 1933*

**AIRPORT EQUIPMENT** — **Hose, gasoline**

*B. F. Goodrich Rubber Company,*
*Akron, Ohio.*

A NEW rubber covered gasoline hose with leak-proof (Permalock) fittings. Made of tough black rubber over cotton braid, can be easily wiped off, and retains its flexibility at freezing temperatures. Manufacturing process insures no rubber can contact gasoline stream. Permalock fittings recommended for factory application only, and are non-reattachable.

AVIATION, *August, 1933*

**AIRPORT EQUIPMENT** — **Lights, flood**

*The Pyle-National Company,*
*1334 North Kostner Ave., Chicago, Ill.*

THE new Type 36,000 GRL landing flood light is for use with the 5,000 watt, 115 volt, Type G-64 bi-post airport lamp. It is 36 in. diam. with Armco iron case, cast aluminum door frame, cast steel yoke and base, and non-ferrous fittings. The apparent beam candlepower is approximately 8,400,000. A clear glass, or a divergent lens with a 50 deg. spread may be furnished.

AVIATION, *August, 1933*

**MATERIALS** — **Lining, fuel tank**

*Thiakol Corporation,*
*Yardville, N. J.*

THIAKOL, a compound of ethylene, dichloride and sodium polysulphide, has been tested as a lining for crash-resistant aircraft fuel tanks. Reports (see Vol. 4, No. 14, Air Commerce Bulletin, U. S. Department of Commerce) indicate that Thiakol-lined tanks may be about 25 per cent lighter, and may be dropped about twice as far as other types of crash-proof tanks without bursting.

AVIATION, *August, 1933*

**RADIO** — **Course indicator, visual**

*Westinghouse Electric & Manufacturing Company,*
*East Pittsburgh, Pa.*

DIAL-TYPE indicator for instrument board mounting for radio range beacon reception. Pointer shows off-course to right or left, and equipment may be adjusted to lay a course at any predetermined angle to beacon course. Operates from single tuned radio frequency receiver in compact mounting. Vibrating reed filter permits simultaneous aural reception on other frequencies.

AVIATION, *August, 1933*

**RADIO** — **Receiver, airplane**

*Westport Manufacturing Company,*
*1114 South San Fernando Road, Glendale, Cal.*

ANNOUNCEMENT has been made of a compact radio receiving set for private aircraft use having a range of from 235 to 700 kc. Models AR62D and AR62R are arranged for direct and remote control respectively for 6 or 12 volt battery operation. Six tubes are used. Dimensions, $5\frac{1}{4}$x$6\frac{3}{4}$x10 in. without mounting bracket. Weights, complete with tubes and accessories, 10 to 13 lb.

AVIATION, *August, 1933*

**SHOP EQUIPMENT** — **Drill, electric**

*Independent Pneumatic Tool Company,*
*600 West Jackson Boulevard, Chicago, Ill.*

A SMALL sized addition to the regular line of Thor electric drills has been announced. This tool has all the characteristics of the larger models, and will handle drills up to $\frac{1}{4}$-in. diameter. Built complete at the Thor plant the motors are equipped with hand formed and hand wound coils, and armatures are mounted on ball bearings at both ends. Useful for light sheet metal work.

AVIATION, *August, 1933*